NATURAL COLOR FILM

WHAT IT IS AND HOW TO USE IT

By CLIFFORD A. NELSON

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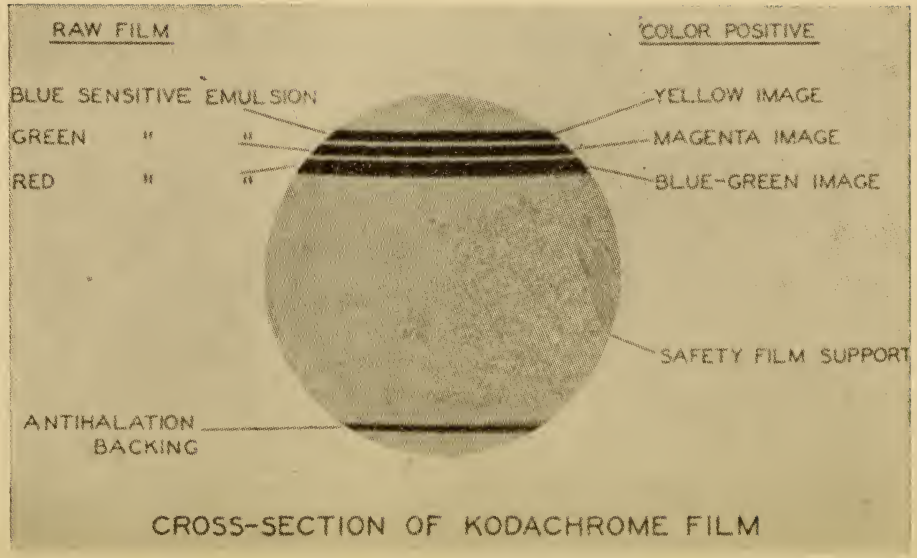

This diagram shows the three sensitive layers, and how they are colored in processing.

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WHAT IT IS
and
HOW TO USE IT

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A work devoted to the technique and handling of "Kodachrome" in motion picture and still photography.

By Clifford A. Nelson

Introduction by
HERBERT C. MCKAY, F. R. P. S.

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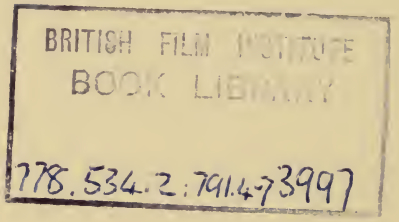

Printed in U. S. A.

Dedicated

To my

Father and Mother

FOREWORD

Amateur motion picture photographers everywhere are fortunate to have the opportunity to capture conveniently and inexpensively the full natural color beauty of their photographic subjects. Before the introduction of 16 mm. color film, one might have predicted that this miracle would be reserved for the most professional of Hollywood cinematographers.

This book describes the fundamentals of making a colored motion picture, with a chapter on colored still pictures. The author believes that it is not difficult for any amateur to get good color results, and he sincerely hopes that his simple suggestions will add much to the quality and entertainment value of the reader's pictures.

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INTRODUCTION

Color is life. While, perhaps, we have not thought of it as such, the very fact that we speak of color in music, in drama, in fiction and in life itself shows what a truly tremendous influence color does exert. Not only is the whole world about us as a continuous blaze of color, but we deliberately aid Nature by incorporating color into most of the physical objects which are used in our everyday routine.

It is strange indeed that in this, as it might be said, the color age, the outstanding exception should be in photography. In the reproduction of objects, people and scenes, where true reproduction demands color if any approach to fidelity is expected, we have been remiss. Our photographs are still largely the dull, drab black and white caricatures we have always known since the early days of wet plates.

Perhaps the reason may be related to the fact that photography is an artistic convention. Photographs, good as well as poor, bear only a slight resemblance to the original! We learn to read photographs just as we learn to read type matter. It is significant that the primitive man, whose perception and memory are linked insolubly with depth and color finds the photograph meaningless. He cannot even determine the top or bottom of the picture

—but when we add color to the picture and the apparent suggestion of depth which color always brings with it, then we have the transformation. No longer do we have a conventional symbol; we have faithful reproduction.

This is the true reason for giving color a hearty welcome. We are not particularly interested in a beautiful girl clad in a brilliant red bathing suit playing with an equally brilliant blue, yellow and green beach ball. We are interested in the fidelity of color reproduction which serves to convince us that we are seeing the original. This is the color which contributes to form, to distance, to texture; this is the color which aids the eye in establishing its constants when seeing the real object.

Color which is not glaring, but which is so grayed that its identity as a color is not immediately recognized is the color which will prove the most valuable in photographic reproduction. For example, imagine a concrete enclosure, strewn with light oat straw and in it a pair of zebras, white and black. The subject is apparently an ideal one for black and white, but a color photograph will separate the actual colors, the creamy tinge of the white stripes in the animal, the straw white and the dirty light gray of the cement. In such a picture the spectator will often fail to realize that he is seeing color, but the picture will have a fidelity of tone which will surpass anything black and white can do.

These things have been known for years, and photographs in natural color have been made for years, but between the realization of the value of color and the execution of the color print there has always existed the

gulf of difficult manipulation. The cost in time, patience, skill and money has been too great to make it worth while. Only with the introduction of a color process which is available to every amateur, has the full value of color been fully appreciated. Now that such a process is available, the amateur must do his part, small as it is, to acquire for himself a library of films which will not merely represent, but which will actually reproduce the original subject, just as the eye saw it.

The introduction of Kodachrome has placed in the hands of the non-professional user, a color medium which will reproduce color with almost perfect fidelity. Naturally there will always be a certain disparity, one which is less of a technical and more of a psychological nature. When we speak of exact reproduction of color, we usually neglect to state the nature of the standard of comparison. This is essential if the comparison is to have any value whatsoever. It is enough, however, to have a medium which will reproduce intense colors in their full strength and beauty and at the same time one which will reproduce delicate tints, which will reproduce the suggestion of color in the heavy shadows and which will reproduce the full gamut of grayed color until we reach the verge of achromatic gray. Such a medium is Kodachrome.

It must be remembered that any medium which will respond with such delicacy to the stimulus of color values will also respond to equally minute variations from normal treatment. You cannot expect a film which will reproduce pastel tints accurately to react normally when gross errors of exposure have been made. It is not enough to use a

meter, not enough to follow exposure charts. Some study of conditions and the intelligent exercise of personal judgment must be brought into play.

In Kodachrome as in all color processes, the color values are merely chromatic interpretations of a differential exposure. It is obvious that too much or too little exposure must necessarily produce a color distortion. In the subject which receives strong sunlight it is impossible to avoid both under and overexposure in the same film. The latitude of the film is simply not equal to the task of correctly recording the tremendous extremes of light intensity which are present under such circumstances. Naturally the shadows will exhibit the errors of underexposure while the highlights will reveal the color distortion of overexposure. Highlights will be washed out thin, and while almost colorless will exhibit a suggestion of ruddiness. Shadows will be muddy in tone with a bluish cast. This is not the fault of the medium but the fault of the photographer. As a matter of fact, close observation of the original will show similar effects. Even visually we lose color sense in deep shadows while glaring light washes color away.

In the case of visual perception, we see partly what the eye transmits and to an even greater extent what we know to be the case. We cannot plainly see an unfamiliar object in either deep shadow or in too glaring a light. We see familiar objects merely because the eyes of memory aid the physical eyes. In many, indeed in most cases, the eyes of memory are far from dependable. Very often you will

find individuals who view a color film with great disappointment and who exclaim in dismay,

"Oh, that's not at all like the real color!"

Then, when you exhibit the color picture side by side with the original, and demonstrate the accuracy of the color, the reply will be somewhat like this:

"Now isn't that funny? I would have sworn that the color was such and so."

And that is the explanation of nine-tenths of the color failures encountered with Kodachrome. You cannot insult an individual by telling him he cannot see color, but in the face of demonstrated fact, the case is self evident. The peculiar mental reactions to color which vary with individuals and the failure of color memory are far more common than failures of the film to record facts.

When the film is a failure, provided you have done your part in exposing it properly, disinterested examination of the facts will usually demonstrate that the film is correct and the critic is at fault. As a matter of interesting fact, carefully made Kodachrome prints provide an excellent means for developing a critical color sense.

Examples of mistaken color perception are legion, but experience will reveal them to you. The only thing required of you is the proper use of the medium offered. There is nothing very complicated to learn. In fact, the information which Mr. Nelson has so clearly presented in this volume is all one needs to know in order to produce color prints of superb quality. It has been a pleasure to read this volume in manuscript form and to discover the

clear and interesting manner in which the subject has been presented.

We feel fully justified in saying that a careful reading of Mr. Nelson's words and a painstaking application of the principles he presents will insure the highest quality of result in practically every case. We extend to Mr. Nelson our heartiest congratulations for preparing a valuable addition to the photographic literature of today.

Herbert C. McKay, F.R.P.S.

New York City
March 18, 1937

NATURAL COLOR FILM

CHAPTER I

WHAT IS COLOR FILM?

Early Demonstrations

From photography's infancy, innumerable attempts have been made to produce photographs in color rather than in monochrome. During the year 1861 in the lecture theatre of London's Royal Institution, James Clerk Maxwell, physicist, demonstrated to a breathless audience how it could see pictures in color. From three photographs of a piece of colored ribbon—one red, one green, and one blue—he made three lantern slides. By means of three projectors, each with a filter of the same color as that used in taking the negative that he had in that projector, he projected a colored picture of the piece of ribbon.

Maxwell's demonstration formed the basis of what is known as the "additive process" of color photography. It utilizes a simple black and white print, and places appropriate filters between the film and the screen, virtually adding color to the shadow of the black and white image. With modern equipment this process renders good color reproduction, but it is not altogether satisfactory.

Eight years later, in 1869, a Frenchman named Louis Ducos du Hauron published a most extraordinary book, "Les Couleurs En Photographie", which outlined prac-

tically every process of color photography that has been used up to the present time.

In 1921 two New York men, Leopold Mannes and Leopold Godowsky, Jr., conceived the idea for a novel color process. These young inventors were musicians and their names were well known to the musical world when they commenced the study of color photography as a hobby. As a result of their collaboration with the Kodak Research Laboratories, under the capable supervision of Dr. C. E. Kenneth Mees, they joined the Kodak staff in 1931. While working with organic chemists, emulsion-makers, dye specialists, photographic chemists, and men skilled in photographic operations, they began to get results.

Definition of Color Film

The structure of the sensitive lining of the eye is such that there are two types of nerve terminals, the rods and the cones. The rods are not specifically sensitive to color, but the cones are. Although alike in form, the cones are divided into three types depending upon the color group to which each is sensitive. These groups of color are approximately the same as the tri-part division of the spectrum used in color photography, namely, blue-violet, green and red-orange. If all three groups are equally excited, we have the sensation of white, but as soon as the response of any one or two of these groups is lowered, we have a sensation of color. Thus, color vision is actually a three-color process, and if we make color record negatives, using filters corresponding to the visual color divisions and then print these negatives, each in the color comple-

mentary to the filter used, we shall be able to make photographs in colors which bear a close similarity to the original.

Since a motion picture is projected by transmitted light it can readily be understood that there are two ways of getting a colored picture on the screen. The first is to recombine our three primary-color images in a fully colored print, so that, starting with the white light of the projector, the print itself removes from the beam all of the color frequencies not desired to make up any given portion of the picture. This is known as the subtractive method and is the basic nature of Kodachrome.

The second method utilizes a simple black and white print, and places appropriate filters between the film and the screen, virtually adding color to the shadow of the black and white image. This is known as the additive method, of which Kodacolor was an example.

In subtractive color-processes, the formation of color depends on the principle followed by nature. Naturally occurring substances are those which absorb part of the white light falling upon them. Thus a red substance is one which absorbs blue and green, so that when it is illuminated by white light, everything but the red is absorbed. A substance which is blue-green in color absorbs the red light. Blue-green is said to be complementary of red because when added together they make white. It is usual to speak of the compound complementary as a "minus" color. Thus the peculiar bluish-green which results from the removal of red from white is often called "minus-red", as this is a more exact term than "blue-green". On the contrary, however, we should not call red "minus blue-

green'' because in this case ''red'' is the more definite term. A minus color is made up of the entire spectrum minus one specific color.

It is possible to find three dyes of these colors; namely, minus blue, minus green, and minus red. A mixture of any two will result in the formation of a primary color. For instance, where minus blue, and minus green are overlapped, blue and green will be absorbed and only red will remain, so that the area appears red. Where the minus colors overlap, each dye subtracts one of the primary colors, so that, ideally, all light is absorbed and the area appears black.

Other less saturated colors can be obtained by suitable combinations and the whole range met with in nature can be simulated. When a mixture is made of the three minus colors, each diluted so as to give only a partial absorption of the corresponding primary (if the degree of absorption is equal for all three) the result will be the formation of gray.

How Kodachrome Works

The following description of Kodachrome is presented for those amateur color photographers who wish to delve a little more completely into the technical description of Kodachrome. The permission to use this most interesting description has been granted through the courtesy of the Eastman Kodak Company to whom the author is greatly indebted for their very kind cooperation.

In any subtractive color process three separation negatives must first be made by photographing through red-

orange, green, and blue-violet filters. Three positives are made from these negatives and the silver of these is then converted in some suitable way to give a colored image in place of a silver image. In the positive obtained from the exposure through the red filter the deposits of the image represent the degree to which red is absent from the original scene and they must, therefore, obstruct the red rays. At the same time they must freely transmit the blue and the green rays, so that these may pass through the adjoining layers containing the other partial positives. To absorb red, yet pass blue and green, this red filter positive must clearly be printed in minus red. Similarly the blue-filter positive must be printed in minus blue, and the green-filter positive in minus green. These are superimposed dye layers each of which is a positive image printed in a dye of one of the minus colors: it has only to be placed between the light source and the screen (or superimposed on white paper) to give a color picture.

It should be noted that with such a film there is no screen pattern; nor will the maximum screen brightness be any less than that obtainable in ordinary black and white projection, for it will be transparent when all the layers are free of color and there is no absorption of the light. In these respects the subtractive processes possess advantages of the greatest importance over the additive process of color projection. All previous processes of color cinematography available to the amateur have been additive processes.

The Kodachrome process is the only practical subtractive process in which one and the same film both effects the

KODACHROME

DIAGRAMMATIC SKETCH OF EMULSION LAYERS WITH INTERMEDIATE GELATINE LAYERS OF FINISHED KODACHROME FILM

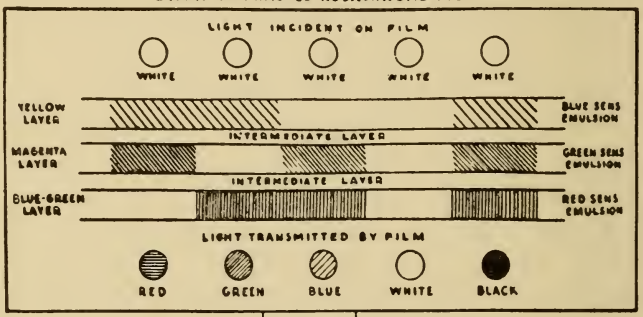
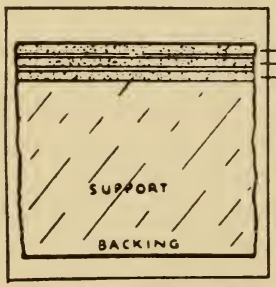


FIG. 1.

Diagram shows how Primary Colours – Red, Green and Blue – and Black and White, are obtained from complementary Colours – Yellow, Magenta and Blue-Green Any other colour may be produced by suitable combination of these three Complementary Colours

FIG.2



SECTION thro' KODACHROME FILM (HIGHLY MAGNIFIED_)

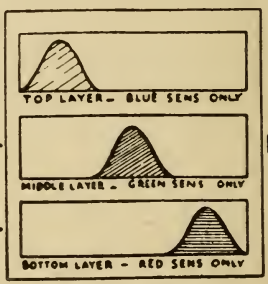
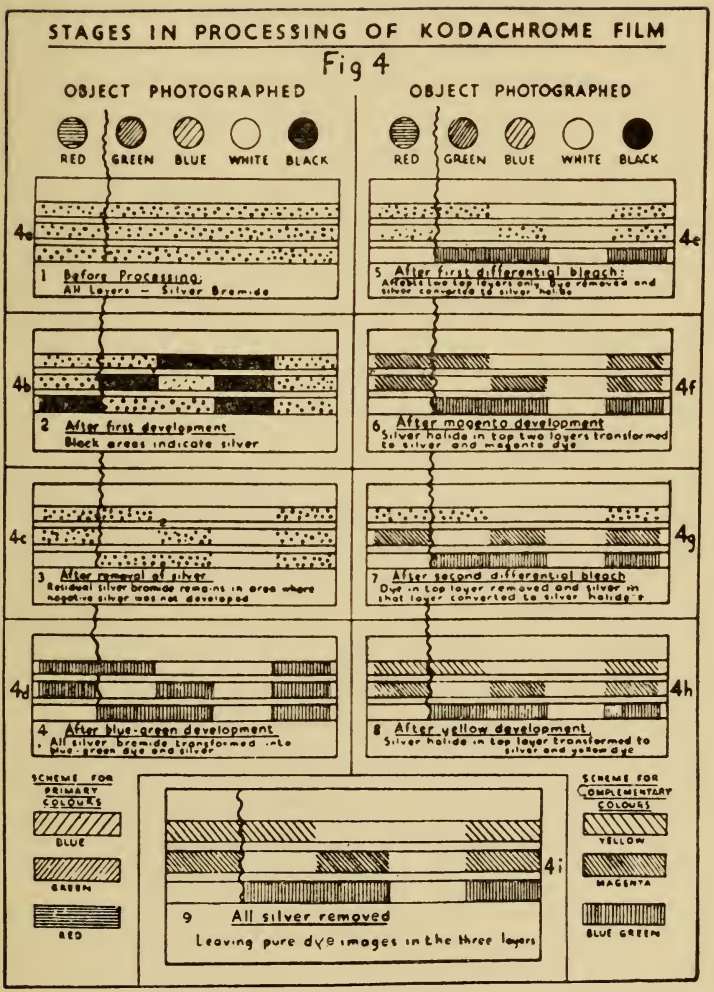


FIG.3

SENSITIVITIES OF EMULSION LAYERS


STAGES IN PROCESSING OF KODACHROME FILM
Fig 4
OBJECT PHOTOGRAPHED
RED
GREEN
BLUE
WHITE
BLACK
4a
1 Before Processing.
All Layers — Silver Bromide
OBJECT PHOTOGRAPHED
RED
GREEN
BLUE
WHITE
BLACK
4e
5 After first differential bleach:
4b
2 After first development
Black areas indicate silver
4f
6 After magenta development
Silver halide in top two layers transformed to silver and magenta dye
4c
3 After removal of silver
Residual silver bromide remains in area where negative silver was not developed
4g
7 After second differential bleach
Dye in top layer removed and silver in that layer converted to silver halide
4d
4 After blue-green development
All silver bromide transformed into blue-green dye and silver
4h
8 After yellow development
Silver halide in top layer transformed to silver and yellow dye
SCHEME FOR PRIMARY COLOURS
BLUE
GREEN
RED
4i
9 All silver removed
Leaving pure dye images in the three layers
SCHEME FOR COMPLEMENTARY COLOURS
YELLOW
MAGENTA
BLUE GREEN

color separation in the camera and provides the color "print" for projection. This result is achieved by the use of a multi-layer film (see fig. 2). Three superimposed layers, sensitive to the three primary colors (see fig. 3) cause the color separation to be made automatically during exposure. They are afterwards converted by means of a special reversal process into three dye layers of the complementary colors, which, being superimposed, give the desired color print.

Fig. 2 shows a cross section of the film greatly enlarged. The section was cut after the film had been exposed and developed to give silver in all three of the light sensitive layers, so that they might be readily distinguished from the layers of gelatine that separate them. The diagram gives a very good idea of the extreme thinness of the coating. The film itself is of the thickness ordinarily used for 16mm. film. This is about 0.005 of an inch, and it is seen from the section that the total thickness of the five layers is only a small fraction of this amount. Their total thickness is, in fact, no greater than that of the single emulsion film used for ordinary black-and-white cinematography. The film is backed with a layer of jet black similar to that used with ordinary Cine Kodak Panchromatic stock, to prevent any halation.

The two separating layers of gelatine serve a double purpose. They help to isolate the chemical reactions that take place in the different layers during the conversion of the silver images to transparent dye images, and they allow us to restrict the light received by any one layer to the color appropriate to that layer, by the inclusion

of a suitable dye in the gelatine layer immediately in front of it, making a filter of the layer.

The spectral (or specific color) sensitivity of the emulsion layers is represented in fig. 3. Next to the base is a panchromatic emulsion that has a very low sensitivity to green light. Its response to green can be reduced to negligible proportions by incorporating a suitable dye in the layer of gelatine which is coated over it. Next comes an emulsion layer sensitive to blue and green only. Only green light affects this layer because a yellow dye in the layer above absorbs all the blue light. As a consequence of this, of course, no blue light can reach the panchromatic emulsion of the bottom layer so that this responds to red only. The top layer consists of a "color-blind" emulsion which records only the blue component of the incident light. The top layer records the blue light only, the middle layer, the green light, and the bottom layer the red light only. Among them they cover the whole of the visual spectrum. Thus, when the film is exposed in the camera and an image of the scene photographed is formed on it, this is automatically broken down to give three separate records which produce the three complementary primary color images, when the processing is completed.

Processing consists in converting the latent images formed on the three layers into dye images in colors complementary to the colors to which the layers are sensitive. The conversion depends upon the use of "coupler developers".

In coupler developers, the developer is oxidized when it reduces the silver halides and the oxidized form combines

with another chemical which is present in the developer (known as a coupler) to form the dye. In consequence of this, the amount of dye formed is proportional to the amount of silver developed, and, if, subsequently, the silver is removed, an image in dye only is obtained. In considering the stages involved in the processing of the film, let us take as illustration the photographing of the red portion of a colored pattern on a black ground.

Figure 4a represents a cross section, again greatly magnified, of the film in the camera. Let us imagine that at this point the image of a very thin line of the red part of the pattern has been formed on the film by the camera lens. The red light will pass through the two uppermost emulsion layers without influencing them, and will affect the lowest layer only, causing the silver halide grains in that layer to become developable.

The film is processed by means of continuous processing machines of special design in which it passes in succession from one to another of a whole series of baths, in each of which one operation takes place. The diagrams in fig. 4 indicate the successive treatments to which the film is subjected and its condition at the completion of each main stage. The portion of the film with which we are dealing here is isolated at the left of each diagram by a "wavy" line, although we shall give superficial attention to the other colors indicated—the part of the diagram which lies to the left of the "wavy" line represents the part which is affected by the red line referred to above.

The first stage (fig. 4b) is development with an ordinary developer. In the case we are considering, this will cause

silver halide to be reduced to metallic silver in the affected part of the bottom layer only.

The film then passes without fixation into a bleach bath which removes all the developed silver and leaves the unexposed silver halide (fig. 4c).

It now receives a printing exposure before passing into the first coupling developer. This is a specially compounded developer which reduces the halide in all layers to silver with the simultaneous production of an equivalent amount of the blue-green dye (fig. 4d), except in "white" and "red" areas.

The film next passes into a slowly penetrating bleach bath which removes the dye, and oxidizes the silver back again to silver halide, in those layers of the film to which it is allowed to penetrate. For this purpose, its penetration into the film layer is carefully controlled and is arrested before it reaches the bottom layer. By this very delicate operation, it is possible to remove all of the dye (except the blue-green in the "blue", "green" and "black" areas which we are not considering in this example), while reconverting the silver in the upper two layers to the halide (fig. 4e).

The film is re-exposed, and the next bath contains the second dye coupler developer: in this, all the remaining silver halide is reduced to silver plus a magenta (fig. 4f). The film then proceeds to the third machine.

Another controlled bleaching operation follows. This time the bleach bath is allowed to attack the top layer only, leaving the magenta dye untouched in the second layer and giving, in the top layer, silver halide once again (fig. 4g).

After another exposure to light, the film passes into the final dye-coupler developer, and the remaining silver halide, which is now all located in the top layer, is converted to silver plus a yellow dye (fig. 4h).

At this stage the film contains developed silver in all three layers (but only in the two top layers as far as our red is concerned). It remains only to pass the film through a bleach bath that will remove all the silver without affecting the dyes, in order to be left with the dye images only (fig. 4i).

It is evident that where the red light was incident there is no dye in the red sensitive, i.e., the blue-green (or minus red) layer, so that when the film is projected there will be no red absorption in this part. The green light will be subtracted by the magenta layer and the blue by the yellow layer, so only red will be transmitted. The two upper layers contain a full complement of dye in each, so that absorption will be complete and the pattern will be seen in saturated red.

Absence of the magenta layer would allow only green light to be transmitted: in the absence of the yellow layer, only blue light could pass. Hence we arrive at the set of conditions which we have already seen to be necessary to the formation of pictures in color by the subtractive method. It will be evident that colors other than red are produced similarly by dye deposits in one or more layers: and, further, that by suitable variation of the dye concentration in these three superimposed layers, such as occurs when only part of the silver bromide is exposed

and removed by reversal, all possible colors can be produced.

The process involves the carrying out of quantitative chemical reactions in sharply restricted layers of a gelatine film which itself has a total thickness of less than one-thousandth of an inch. At first sight it may seem extremely unlikely that such a process could lead to an image of good definition. Actually the definition is in practice extremely good, fully equal to that of black and white pictures ordinarily obtained in amateur cinematography, using reversal film.

Kodachrome is supplied in two types, the ordinary for use under normal daylight conditions, and the fast Type A, which is designed for artificial light. Most amateurs prefer to use the Type A only, as special filters are available for all motion picture cameras which give proper balance for the Type A to daylight. Moreover, as the filter just balances the increased sensitivity to daylight, the exposure factor remains the same in both daylight and artificial light. This factor is similar to the daylight Kodachrome factor, so that by using the Type A with its daylight filter it is possible to enjoy the full range of Kodachrome usefulness with a single camera loading.

The film is loaded just like any film, and throughout the exposure nothing unusual will be necessary. As the average stops employed in summer daylight will range from *f*8 to *f*11, it will be found possible to make color shots under practically any conditions which are favorable for black and white, and it even makes possible slow-motion color shots.

CHAPTER II

WHAT TO PHOTOGRAPH

Unfortunately, many amateur movie makers consistently alibi for their carelessly photographed pictures by saying, "Oh, I am just a rank amateur and am merely taking a few personal pictures for myself." As a matter of fact, the more personal the pictures the better they should be. It is the privilege of the folks at home to see themselves well photographed. Also, there is always a time in every movie enthusiast's life when he will want to show his pictures to at least a small audience.

Don't have your subjects pose or make faces in front of the camera. A simple procedure is to have them do things apparently unaware that they are being photographed, or else to work them into a little scenario such as a family picnic, a trip to the zoo, or a summer vacation trip. This chapter is devoted to a few suggestion on what to photograph and how to make your pictures more interesting. In every case it will be well for you to plan a tentative scenario in advance.

Photographing Children

Pictures of children will be among the family's most treasured possessions, and will be priceless in later years;

you will want to photograph them as well as possible. Children are carefree and bouyant, and they should not be forced to pose. Try to present their natural actions, experiences and attitudes; record the habits that are characteristic of their age, study their movements and catch them unawares playing with toys and pets. You will find it very easy to build up the color logically through the addition of colored clothes, bright toys, flowers in the garden. However, don't "scatter" in too many objects or too much color as the child should remain the center of interest. If you will conscientiously preserve a color motion picture record of your children you will treasure your efforts in after years.

Animal Pictures

Animal pictures are magnificent in color. That all the world is interested in animal movies is demonstrated by the popularity of such pictures as those of Frank Buck and the late Martin Johnson. Since most of us cannot visit jungles, the zoo affords our next best excellent opportunity. Kodachrome will record the brilliant markings of the tigers and leopards, as well as the bright plumage of the tropical birds. In some modern zoos it is possible to photograph animals against natural rock backgrounds instead of the usual cage bars. Interesting continuity bringing the family into the story can be planned. While on the subject of photographing animals it is well to mention also the value of featuring the family pets in some of your movies. Dogs and pups, cats and kittens, the Easter rabbit, or the polly who spills the family secrets,

all make fascinating color movies which will be valued by the family for years to come.

The Circus

The Greatest Show on Earth with its comical clowns, wild animals, daring performers, and mammoth street parades makes an excellent setting for either a general or family color movie. The inside tent shots are difficult but not impossible to record in color, but the setting up of the circus equipment, the bright wagons and colorful clowns in the street parade and the trained animals all film beautifully in Kodachrome. Here again it is easy to create more personal family pictures by weaving in a little circus scenario about them. A short circus reel in color is sure to amuse the children and the grownups will enjoy reliving the similar experiences of their youth.

The Summer Vacation

A summer vacation provides endless opportunities for making brilliant color movies. The scenario for the family outing can include scenes of the confusion of packing and leaving, views of the scenery enroute, humorous intimate pictures of the camp, fishing, riding, and hiking trips, and perhaps even a climb to one of the high mountains. There should be plenty of closeups and the scenery should feature the family, animals, the car, or other figures in the foreground.

Making a movie is a feature activity in many summer and winter camps for boys and girls. The author's "A Mountain Symphony", "The Trail Song", "Trail Thrills",

etc., feature an annual boys' pack trip into the California High Sierra mountains. Leaving San Francisco the boys "pile" into a big truck which carries them and the supplies to Yosemite Valley. In this great glacial valley the boys thrill at the sight of the tremendous waterfalls and show a keen interest in the study of the geology of the spectacular cliffs. They pack their animals with three weeks' provisions and leave for the high mountains. In the camps the activities feature fishing, swimming, and the general technique of camping. Now and then there are a few humorous incidents adding to the merriment of the outing. The boys stage a "Kentucky Derby" using the burros as horses. One of our boys attempts to sew a pair of pants without first removing them from his pal. Also several cooking shots are quite amusing. Then the picture is climaxed by a hiking "expedition" to the summit of a towering Sierra peak where we gaze in awe at iceberg lakes, glaciers, beautiful wild flowers, and snow-capped peaks all about us.

With such large groups of lively boys, it can be readily understood that preserving the continuity is not an easy matter. As a matter of fact, we had to plan the continuity for "A Mountain Symphony" after we returned home and started editing the picture. How did we do this? First we named it "A Mountain Symphony". Then we decided to dedicate the picture to John Muir, a famous California mountaineer, and, since he was so fond of trees, we superimposed each of our selected Muir quotations on a different tree background. We had already photographed a collection of tree pictures on the trip. Then, of course, as will be explained in the chapter on "Color and Music", we

selected appropriate music for each set of scenes. Instead of merely splicing the films together for a few private showings for the boys and their friends, we tried to organize the scenario, and as a result of our efforts, "A Mountain Symphony" has been shown as an educational feature to over 100,000 interested people. Next time you go on your vacation, resolve to make a picture that you will be proud to show your friends.

Scenics

If you are a serious amateur and feel the urge to produce a finished movie, try a scenic. A scenic is a succession of scenes of a section of the country, designed to present the utmost in photographic appeal and entertainment value. It is usually necessary to make a preliminary study of the subject in order to present the best possible photographic record of it. The sequences should be planned to give the impression of a personal visit with an interesting and competent guide. Our most popular scenics are those from foreign lands, but mother nature has provided innumerable opportunities for us to get equally colorful travelogues close to our own home. Making a color scenic would be an ideal way for a serious amateur to spend a vacation. He would soon discover that the deserts of Arizona, the Indian country of the Great Southwest, the Rockies, the Sierras, the Adirondacks or any of our National Parks have the makings of scenics as appealing as any theatrical import from Tahiti or the Alps.

If you expect results of which you may be proud you must first study your subject and thoroughly familiarize

yourself with it. Better yet, choose a subject with which you are already familiar. Remember that some of the places that may seem stale to you will be highly entertaining to your audience, when photographed in natural color and interpreted by your own originality. Less than half a mile from the author's home there is an ocean beach. Amateur cinematographers have shown unusual originality in developing this very simple subject. Their interpretations include general views of the rhythmic movements of the waves, the eternal battle of these waves against the rocks, slow motion analysis of the movement of the waves, the ocean mist, and telephoto views of the seals and birds on Seal Rocks. One ingenious amateur composed simple lines of poetry for titles and selected appropriate music for sound effects. The author is now photographing his city in a rather unusual manner. The picture, called "Around The World in San Francisco", gives the impression of a world tour to foreign countries and includes the Oriental atmosphere in the Japanese Tea Garden and of Chinatown, the colorful Swedish and Norwegian folk dances of the Scandinavian sections, the Russian festival, the spirit of old Italy from the Italian quarter, and so on, "around the world". The continuity is expressed by inserting action title backgrounds such as airplanes, steamships, and trains between countries in such fashion that the impression is given of traveling from one place to another.

Having studied your subject in general, break it down into its component parts and analyze each. Assemble your results and decide on your continuity, then move around on your shots and determine the best possible angles.

Use objects or human figures in the foreground but avoid people who are conscious of the camera (or else train them). Have patience and shoot at the ideal time. If you include much of the sky wait until it is blue and the clouds are richly defined. Don't let your scenes become monotonous. Introduce some motion wherever possible, such as the paddling of a canoe, the casting of a fly in a lake or the swaying of trees in a mountain scene. Make sure, however, that your foreground strengthens rather than weakens the background. Introduce animals and birds wherever possible. If you are fortunate enough to have several lenses, use them. Build up your long shots with medium and closeup shots. For example, when some patches of wild flowers are taken with a one inch lens, they show a barely recognizable mass of color; but when they are taken individually with a 4½ or 6 inch lens they show up as magnificent color portraits. Control your tempo by proportioning your values of the individual scenes and avoid monotonous repetition or sameness. The author recommends panoraming only on very rare occasions. If you must indulge in a little "panning", a good way to do so is to follow a moving object in the foreground.

When you are satisfied that you have photographed and edited the film to the best of your ability, test it on yourself and on your friends. If photography and color are right and the picture is easy to follow, then select your music. Project your films with the same amount of care you used in taking them and you should have no need to alibi and apologize for your show.

Flowers and Gardens

Whether the Kodachrome fan chooses flowers and gardens as a worthy subject for photography, or the garden enthusiast wishes to preserve his garden experiments in Kodachrome, it cannot be denied that everyone enjoys seeing lovely garden pictures in true, natural color. With Kodachrome, a garden's beauty will become a joy forever. Every experiment or achievement, every plant, flower, or garden arrangement, will live through the years to be enjoyed at your command, during any season. If you do not have a garden of your own, photograph wild flowers, or make arrangements to shoot the exhibits of your local gardener. Although mass shots may seem spectacular to your naked eye or as seen through the viewer of your camera, you will discover on reviewing your results that individual flower portraits are more interesting. At least shoot enough portraits so that your flowers are readily recognized or identified. Use your telephoto lens. Add some action by waiting for a slight breeze or for an insect to buzz around.

Hunting and Fishing

With the adventures of hunting and fishing told and retold in color pictures the hunter has a trophy better than any memory of a venison steak, a trout dinner, or even a pair of antlers over the fireplace. Try to develop a story or light scenario. Include everything of interest in the outing. You and your sportsmen friends will live the trip over many times in retrospect.

BOATS AND WINTER

Boats

Are you interested in boats? Small fishing boats, graceful yachts, stubby ferryboats, streamlined ocean liners, and sturdy battleships all make colorful and interesting pictures. As with other pictures don't take them all from one broadside angle. If possible, get permission to go aboard and show detailed studies of structure. Introduce as much action as possible.

Winter

Winter scenes and winter sports activities present many possibilities for filming sparkling color and fast action. Filmers who live where winter spreads a blanket of snow have opportunities to photograph snow subjects; many others live where winter sports are available within short driving distances. Snow pictures should be crystal clear and bright, full of color and alive with action.

Shooting snow is not easy and you will find it necessary to be especially careful of your exposures. Study the readings of your exposure meter. Remember that in winter, light is not so strong as it is in summer, even though brilliant reflections may lead one to believe that this is not true. It is evident that reflection is very great on a bright sunny day. However, when the sun is hidden behind the clouds—do not make the mistake of stopping down too much to compensate for the "would-be" bright snow. As mentioned in the chapter on exposures, be sure to expose for the object you are photographing. The light reflected by different objects will vary considerably, and Kodachrome

does not have the latitude to compensate for great differences.

Beautiful effects are too numerous to describe. Frost, icicles, snow on trees, and other objects, will all compose beautiful scenes. Action will feature ice skating, skiing, tobogganning, and lively winter enthusiasts in colorful costumes.

Your Business

If you care to try some very practical filming, try photographing your own business. There is an interesting color picture in nearly every industry and in many professions. Recently the author made an indoor Kodachrome movie of a factory which specialized in the smelting and refining of precious metals. This complete picture showed the process from start to finish. The pouring of the red hot slag from the flaming blast furnaces is a thrilling sight in Kodachrome. Medical and dental pictures are also interesting and spectacular in color.

CHAPTER III

GENERAL TECHNIQUE

Handling your camera is of primary importance. First read the simple instructions that the manufacturer furnishes. You will discover that most substandard cameras are surprisingly easy to operate. After you have familiarized yourself with your camera you will find that the following suggestions are helpful.

Cleanliness

Many amateur photographers disregard the importance of cleanliness. The lenses as well as the inside of the camera should be clean at all times. Check the outside surface of the lens for each picture, and clean both sides of all of your lenses at least once every day that you use the camera being sure to touch them with nothing but lens tissue. Particles of dust or finger marks will effect the screen image. You may observe small yellow particles of emulsion in the camera after you expose a few hundred feet of Kodachrome film. Clean the film gate with a small, good quality camel's hair brush. Occasionally brush the inside of the camera case and all its compartments. Always return the camera to its case when it is not being used. Oil the camera according to the instructions furnished by the manufacturer.

Loading the Camera

After the camera is cleaned and oiled it is ready for loading. Again you will find specific directions in your camera instruction book. Do not load or unload the camera in direct sunlight. Kodachrome emulsions are now fast enough to require the same loading conditions as black and white film. Photographers shooting only one roll of film during the day can load the camera at home and unload it when they return. If changes of film are necessary during the day, they must be accomplished in a subdued light. Keep the film tension tight on the spool. Allowing it to become loose may cause part of the film to become fogged. Make sure that the film is properly threaded in the camera by running it for a brief time before closing it.

Exposure and Distance

Regardless of the number of gadgets that you have on the camera, there are two adjustments to make on your lens which are fundamentally necessary for making a picture, i.e., (1) the lens diaphragm, and (2) the distance scale on focusing lenses. The diaphragm acts as a control for regulating the amount of light passing through the lens to be exposed on the film. If the light is bright, the diaphragm is set for a smaller opening so that the film will not be overexposed. If the light is dull the diaphragm is set at a larger opening so that the film will not be underexposed. If the film is overexposed, it will be too light; and if it is underexposed, it will be too dark. Somewhere between those two extremes lies the correct exposure. Re-

ferring either to the exposure charts or to the exposure meter you can determine this value. The subject of exposure, especially as applied to Kodachrome film is dealt with more completely in another chapter.

The second fundamental consideration is setting the distance scale. This is simply a matter of estimating or measuring the distance your subject is from the camera and then remembering to set your camera for that footage. Neglecting to do this will result in an unclear or fuzzy-looking picture. Although many fast lenses are of the focusing type, some are of the universal focus style which are set for an average distance and therefore cannot be set by the filmer.

When the image of any given object appears sharp and well defined on the film, the lens is said to be critically focused. For objects which maintain their same distance from the camera, focusing is a simple matter since you merely set the footage for that distance. However, when objects move toward or away from the camera, you must set the footage for the average distance, or, if time permits, change the footage according to the variations of distance. The distance that an object may move toward or away from the camera and still remain in focus is known as the depth of focus. This depth of focus is greater when the lens opening is smaller. When absence of sufficient light does not permit stopping down it is necessary to set your distance meter to correspond more accurately with the distance that the camera is from the subject. With a reasonable amount of stopping down most average subjects can be shot

at a setting of twenty-five feet. Hence there is a red marker on many lens mounts indicating that distance. It is important to set your footage for the distance of the most important subject or subjects to be emphasized.

Let us now consider a practical example. Our scene consists of a lake and a mountain range. Obviously we set our footage for infinity. Suppose that we add interest to the film by placing a figure, such as a fisherman, in the foreground. The figure is fifteen feet from the camera. The day is bright enough to stop down to *f*11 or *f*8. If we wish to emphasize the fisherman catching a trout and include the mountains in the background we can set the camera for a universal focus of twenty-five feet. If the day were dull and the light value was f1.9, then we would set the footage for exactly fifteen feet so that the figure would be in focus. The background would be omitted.

Lenses and Focal Lengths

How many lenses does one need and what lenses are good for color work? The following paragraphs are designed to answer these popular questions. No attempt has been made to present a complete description of lens structure and function. Briefly, lenses are made up of carefully ground elements of optical glass cemented together in a tube or barrel, and their function is to collect the rays of light reflected from the objects and to direct these rays to the film. Refraction of light rays is accomplished to make this possible. The size of the object is, of course, greatly reduced on the film.

ONE INCH AND WIDE ANGLE LENSES

One Inch Lens

Although experienced amateur photographers undoubtedly enjoy the flexibility of being able to use many lenses of different focal lengths, others will find that they can do most of their photographing with the popular one inch lens usually included as standard equipment. With color films, the lenses of higher speeds such as *f*1.9 or *f*1.5 have a more flexible use as they make it possible to photograph under less satisfactory light conditions. For indoor color photography with an ordinary artificial lighting set-up, the faster lens is practically indispensable. Let us conclude then that the fast one inch lens ranks first in importance and that it is the best all-around lens for color photography, if only one lens is used.

Wide Angle Lens

The next lens that the amateur will use considerably is the wide angle lens which takes in a larger field and also permits the photographer to work at closer range for average or close subjects. It is used when photographing any view which cannot be covered from the photographer's position with the one inch lens, such as panoramic expanses, football stadiums or athletic fields, and it is also used for photographing medium closeups of large groups. For general indoor photography this lens is indispensable as it permits the user to include subjects in small rooms such as the family at the dining room table or the children around the Christmas tree and other similar situations. In commercial photography the author has used the wide angle lens for such occasions as photographing indoor indus-

trial scenes, pictures taken in hospital wards and surgical rooms, and indoor recreation activities. On cameras that have a two or three lens turret, the amateur will find it convenient to include this lens together with the one inch lens on the camera turret. In planning his shots he may decide in which lens the subject shows up to the best advantage by comparing the compositions in the finders of each of these two lenses.

Telephoto Lenses

We have just mentioned that the wide angle lens includes more of the area than the one inch lens. On the other hand, the function of the telephoto lens is to include less of the area of a view within the limits of the same size frame. Therefore, a picture taken with a telephoto lens appears closer or "magnified". As the focal length of the telephoto lens increases, the area covered by the lens decreases. Although telephoto lenses are not necessary, the serious amateur photographer will undoubtedly wish to include one or more in his equipment. The most popular of these is the four or four and one-half inch telephoto. This lens makes it possible to get closeup views of subjects that are far away from the camera, such as wild life, intimate views of peaks, athletic games and sports, and candid shots of people. Photographers will find that the additions of other long focal length lenses, i.e., the two inch, the three inch, and the six inch, will depend upon their specific requirements.

In using telephoto lenses the photographer must keep in mind a few fundamental rules. Lenses of focal lengths

greater than two inches should not be used on a camera without a tripod. Since the telephoto lens "magnifies" the image, it also "magnifies" the movement of the camera. For the same reason telephoto pictures should be "panned" extremely slowly, and in semi-slow motion where the subject will permit. Since the telephoto lens is of very critical focus, the distance between the lens and the subject should be accurately estimated and the footage scale of the lens set to correspond with that distance.

Care of Lenses

In addition to the suggestions for the use of various lenses, let us review also a few general rules for the care of all lenses:

1. Check lens for adjustment accuracy. Occasionally it might be necessary to send the camera to a dealer for inspection.

2. Always keep lenses clean. Constantly examine them for dust particles, etc., and clean with lens tissue. Occasionally use cleaning solution.

3. Always use a sunshade to prevent lens flare. In addition to the regular hood that is provided with the wide angle lens, the author has found it necessary to attach an extra hood.

4. Make sure that the lenses are locked or screwed into position. With a turret camera, the turret must be locked in place so that the lens is in proper position for photographing.

5. In filming under conditions where you experience

changes of temperature, make sure that there is no vapor on the lenses.

6. When shooting Kodachrome make sure that your Kodachrome filter is in place when needed.

7. Remember that the lens is the "eye" or the vital part of your camera. Treat it with care.

8. When using turret cameras that are constructed with independent turret lens and turret finder action be sure that these correspond when shooting the picture.

Tripod

The tripod is the most useful of all camera accessories. In fact the author prefers to remove it from the classification of accessories and term it a necessity for getting good, vibrationless pictures. Although people with steady nerves may be able to get a firm grip on a camera, there will nevertheless be some movement, especially in light weight cameras, where the vibration is sometimes greater.

A good tripod not only serves as a firm base to steady the pictures but it also makes good justifiable "panning" possible as described in the following paragraph. Then, too, the author believes that it helps the photographer to concentrate on planning his pictures. When the camera is on a stand you can study your composition in your finder, adjusting your tripod until you are satisfied with your composition, in a manner similar to that of the "still" photographer planning his picture with a ground glass reflex camera.

The tripod has many other uses. The author sometimes sets up the camera on a location and waits for clouds to

appear at the right place or waits for animals, etc., to appear on the scene. The tripod is indispensable for telephoto shots since the telephoto lens emphasizes the motion or vibration of the camera; it is necessary for supporting the camera when it is running at 8 frames per second. In selecting one of the many kinds of tripods be sure (1) that it is firm, (2) that it moves smoothly for both vertical and horizontal panoramas, and (3) that it suits your requirements concerning weight and convenience of handling.

Although the importance of standing the camera on a tripod has been emphasized there are occasions where a steady hand-held operation will give better results, such as getting quick shots, candid photography, shooting under cramped conditions or as explained in the next subheading: certain types of "panning". In other words, it may be too conspicuous or awkward to use for some shots.

Panoraming

There has always been a difference of opinion regarding the pros and cons of panoraming. Some photographers "pan" at least once every few scenes and some never "pan". However, it cannot be denied that the rapid hand-held "pans" are perhaps the most common fault of the so-called "rank amateur" pictures. These "pans" are usually too fast and too numerous. First, we get half a glimpse of Miss Tourist's friends at the dock; then the camera "pans" up to the lady herself; then the camera swings back to the wharf and then perhaps up to the bridge of the ship, etc. In another case we may see a

twenty or twenty-five foot "pan" of scenery that may combine horizontal and vertical movement covering twenty miles of lateral distances and about ten thousand feet of altitude. Not only do we completely miss seeing the pictures but we usually get a "dizzy headache" before the program is over. Why is this? A "pan" is not natural. Pause for a moment and test this statement on yourself. Look around in a room and notice whether your eye becomes focused on every detail during a sweeping glance. No, you will find that your sight leaps from one point to another. For the same reason your camera scenes should show one scene and then another. Most amateurs "pan" too frequently in a desire to include everything in the picture. Usually they could better present the view by showing a succession of scenes rather than a panorama. In selecting these scenes, choose those that are most striking and most interesting, or in other words, those parts that the eye would rest on during a natural sight panorama.

Although some amateurs maintain that they have been forbidden to "pan" because of their consistent abuse of the procedure, there are many occasions where a good "pan" is a decided advantage. The author has followed the falling comets of waterfalls, especially with slow motion. Other vertical "pans" are applicable to the high peaks and the big trees, especially the Giant Sequoias. Some mountain ranges, lakes, and other vistas present excellent opportunities for sensible and effective "panning". The following fundamental rules will serve as a "pan" guide.

1. "Pan" only when no other technique is practical.
2. Make sure that your "panning" operations are slow

and smooth. It might be well to mention in this connection that the mechanical structure of the camera shutter is such that a fast moving "pan" tends to result in a blur. If you cannot "pan" slowly enough, shoot your non-moving scenes in semi-slow motion, i.e., twenty-four or thirty-two frames per second.

3. Avoid making panoramas of parallel vertical objects or of objects too close to the camera.

4. Limit the motion of your camera so that it describes an arc of not more than forty-five degrees.

5. Stop the "pan" motion of the camera at least twice and allow the camera to run about two seconds or more on the most interesting sections of the "pan". Shoot also extra beginning and closing footage. For example, whenever possible, try to start the "pan" on the lesser interesting scene and conclude with the most interesting scene. The ideal "pan" works up to a climax. In "panning" a waterfall, pause before starting to "pan" on the scene where the fall plunges over the cliff; then stop where there is an interesting foreground; pause where the fall seems to be most beautiful, and finally stop where the water splashes against rocks and forms beautiful mist effects.

Usually "pan" from left to right and never swing the camera back over the same scene. Many amateurs make this inexcusable mistake.

Always rehearse your complete "pans" to make sure that you do not lose your picture or that the angle of view does not change. During this so-called rehearsal you can check on your composition and pick your most interesting and colorful places to stop. Also, you can check on your

variations of skyline, your changes of foregrounds, and the possible variations of exposures which may occur during the "panning".

Although the importance of using a tripod for panoraming has been stressed, there are occasions when a hand-held "pan" will be the most practical procedure for getting the desired results. For "pans" of fast motion, where the positions of the subject change rapidly, it is sometimes much easier and more practical to follow the action with the camera held in the hand than it is to try to follow it with the ordinary two-way "pan" tripod which is not very flexible.

Use of Fading Devices

There are several types of fading devices on different cameras which are used for the purpose of producing various special effects. The simplest and most popular of these effects is the fade which produces a gradual lightening at the beginning of the scene or a gradual darkening at the end of the scene. The technique used will depend upon the type of fading device used as well as the kind of effect the photographer wishes to produce. However, one fundamental rule is never to use the fades too often or make them too long, to prevent monotony and long delays. Although well-planned fades are very effective on black and white film, Kodachrome fades should never be used unless the pictures are correctly exposed. For example, if the general tone of the film is too light, or overexposed, the fade will reveal the correct exposure during the fading process. Also, most Kodachrome fades should be completed quickly.

Another variation of the fade is the lap dissolve which simply means fading out the end of one picture and fading in the beginning of the new one simultaneously. This technique is accomplished on cameras in which it is possible to wind back the film so that after one picture has been faded out, the film is wound back to the beginning of the fade-out period and the new picture is started with a fade-in. The dissolve is very effective for use in the beginning titles of a film or between scenes where one picture is closely associated with the next. The author does not recommend excessive use of so-called trick photography for average subjects.

CHAPTER IV

COMPOSITION AND COLOR

In planning composition and color, simplicity is of primary importance. The old masters knew the untiring charm of simplicity. One can gaze for hours at their works in the old world galleries and every minute find new stories told in simple line and color, yet the most hurried glance captures the spirit of the canvas. Pictures are a universal language whereby thoughts or feelings can be conveyed to others. Unless properly composed and unless the color is properly placed, pictures will not convey a definite meaning.

We all recall seeing unbalanced compositions where the skyline cut the picture in half or the person was looking away from the important part of the picture, and we know how disturbing these pictures are. Equally unpleasant were the first professional color movies with their exaggerated displays of too much color.

Simple Structural Forms

There are many geometrical forms around which compositions are constructed. Common among these are the circle, the triangle, and the radii. They act as the structural support of the picture.

The circular form emphasizes round objects such as arches, lakes, rolling hills, and pleasing vistas. When well balanced it is a most graceful form.

The triangle emphasizes the ever strong pyramid construction for objects such as buildings, mountains, and trees. The pyramid form lends the feeling of power and great strength to the picture.

The radiation form illustrated by the simple radiation of petals of the flowers, by the spokes of a wheel, or by the radiations of a spider's web, is an easy way to concentrate the interest in a complete picture. The center is the hub around which secondary interests radiate.

These three examples of the many simple forms clearly indicate that every picture must have structural composition. Some people note these compositions intuitively and subconsciously. Others must make deliberate effort to plan them. When shooting color it is of special importance to keep your mind on composition since the excitement of planning colors may distract you from other important considerations.

Composition and The Scale

Composition is based on the principle of "scale". Always remember that emphasis or interest can only be obtained by contrasting a larger object with a smaller one.

Just as a building has a structure, a main entrance and an exit, so a picture should have a framework or design, with movement or composition leading in and out of it. In terms of a few practical examples, the following will illustrate.

In shooting desert scenes place a cactus or a figure in the foreground. If you are at the beach, place the children in the foreground, or if you are photographing the children at home, scatter some toys in the foreground. Frame a mountain scene with the graceful flickering leaves of an aspen tree or by the snarled grotesque forms of a high mountain juniper. In the out-of-doors one has the advantage as a rule of being able to wait until he comes to a satisfactory object which may be used for a foreground.

Introducing Figures

When including figures in the landscape, either the landscape or the figure must dominate. The figure introduces scale and enables us to judge the sizes of surrounding objects. The figures should fit in the picture and they should point to the center of interest. For example, in photographing a fishing scene, where a lake and a mountain dominate, take your picture from the back or side of the figure and show him casting into the lake. Never show your fisherman or any other figure staring into the camera with exciting scenery in back of him. Recently in Mexico the author had the opportunity to photograph the Aztec pyramids of Mexico with seventy-five tourists to place in the picture. The main subject formed an excellent pyramid design and the people were photographed in the foreground while a lecturer was directing their attention to the pyramids. This arrangement took care of balancing the large subject with the small subject, thereby creating the feeling of depth and relationship. It also directed the attention of the foreground toward the back-

ground, thereby emphasizing the pyramid which was the center of interest.

If sky is included in your shot, allow it either one third or two thirds of the picture area. Never let the sky occupy exactly half of the picture. In landscapes and seascapes keep the horizon line away from the center. While concentrating attention on the beautiful blue color of the sky there is a tendency to overlook this rule. If the sky is very blue, with a few small clouds, or, if you are shooting a sunset and wish to feature the sky, then allow it two thirds of the picture area. As a matter of fact, the author featured moods of the sky, including clouds, storms, sunsets, sunrises, and alpine glows in a recent mountain picture of a scientific glacier expedition.

When time permits, choose your shots with patience and avoid a scattered appearance. Large masses should be connected with smaller masses by shadow, color or line effects. Composition of light and color are important considerations. The strongest light and the darkest shadow attract attention first. Be conscious of them in planning composition. Keep the center of interest away from the exact middle of the picture.

Color Composition

The subject of color composition is a large and involved field of art, too broad to summarize in this short chapter. However, it is well to mention a few fundamental points. First of all, do not make the very common mistake of overloading your picture with color. Since Kodachrome will record a natural scene quite faithfully, leave the

coloring as natural as possible. The author recalls recently reviewing some camping scenes where the camper was frying delicious rainbow trout over a beautiful flaming camp fire. All was well except for the fact that the camper was wearing a bright vermilion hat which distracted the viewer's eye from the delicately natural shades of color of the camp fire and the trout.

This suggestion not to overload coloring must not be misinterpreted. It means not to introduce color artificially where it does not belong. However, strong pageant-like colors are very beautiful on certain subjects. The costumes of the American Indian, the pageantry of old Mexico, the flaming furnace of a smelting and refining plant, and a spectacular collection of sunsets are a few pictures of the author's collection of brilliantly colored Kodachrome pictures.

In Hollywood, scenes are made to order. Colors and color combinations are planned by expert artists. Composition and color are designed to harmonize with as well as to emphasize the story of the picture. However, most amateurs spot their pictures and then photograph them. They seldom have the time or the opportunity to plan their color schemes. Fortunately, many amateur subjects such as costume pictures, family pictures, and scenics naturally present a certain degree of reasonable color harmony. Some fortunate people are naturally color conscious. Others will find it necessary and helpful to train themselves to be color conscious. The next time you shoot a color movie, ask yourself, is it natural? Is it pleasing? Are there any too-bright or too-dark colors? Is there too much

of any one color? Is there too much or too little contrast? Is the concentration of color on the subject of primary importance? You will be surprised to learn how simple it is to check on yourself.

Colors

There are a few outstanding characteristics of the more popular colors which it might be well to review. Dark red is a true original color. It should not occupy much picture area. It will go well with its contrasting color, green, and it is a good background for vermilion. Vermilion red is a complex color, a mixture of orange and red. It is dangerous to use a large area of this red as it is a very bright and monotonous color, quickly distracting from other colors. However, it very effectively brightens up a picture if used in spots only. Like red, vermilion loses its color quality in the shade or turns to muddy brown if underexposed. Its contrasting colors are blue-green and small amounts of yellow. Vermilion looks well on a background of some dark colors. Black is a good background.

Yellow is the most common of the minus colors. True yellow is not present in the spectrum, but is really minus-blue. When well lighted it is beautiful, but in shadow it may appear greenish. Large areas of yellow may be relieved by blue or deep shades of violet. Naturally it does not appear well next to green or blue-green. Orange is a complex color. It is a mixture of yellow and red. In shadows it changes to a greenish brown. Its contrast is dark blue and it also serves as a good background for

black and small amounts of deep vermilion and dark green. Deep blue, dark reddish-brown and gray serve well as a background for orange.

Green, a mixture of yellow and blue, is always a delightful color to photograph. However, it must be well lighted and properly exposed, or it will lose its quality by turning muddy. Large areas of green, such as an expanse of rolling foothills, should never be photographed alone. It does not go well with blue. Green serves as a good background for white and pink and forms a good background for yellow with small amounts of vermilion.

Blue is a simple color. It should be well exposed in the light as it does not do well in the shade. Its contrasting color is orange. Blue photographs well with the lighter shades of red, with yellow and with light brown. As previously mentioned, blue and green should not be photographed together—unless other colors are used to break up the combination of these two similar colors. Blue-green the combination of both, is not a satisfactory color. However, it will support some of the brilliant red colors.

Violet is another difficult color to try to photograph since it requires plenty of light. However, violet and the deeper shades of purple serve as a satisfactory background for nearly all colors.

Black and white are not colors but they play an important role in color photography since they serve as good backgrounds for many colors. Also, when photographing white, or any very light shades of color, it is well to remember that it is highly reflective, and due to the fact that Kodachrome does not have as great a latitude as

black and white film, you may not be able to include it in shots where there are much deeper shades of color.

If you don't seem to get satisfactory results with some colors, don't be too hasty in blaming it on the film. Your exposure may not have been correct for the light on that color, or you may have tried to use an impractical color combination. For example, the color green is the topic of much discussion, and the author believes that when accurately exposed for, it is one of the most beautiful Kodachrome colors. Unfortunately, although green blends well with delicate colors such as pink and yellow, the darker shades of green require much more exposure. For example, it is hardly possible to get a satisfactory green on dark leaves and at the same time not overexpose a delicately colored flower in the same picture and vice versa.

CHAPTER V

LIGHT CONDITIONS AND EXPOSURE

Importance of Correct Color Exposure

One of the most important requirements for getting good color results with Kodachrome is "hitting" the correct exposure. Color has a great appeal to our senses if it is natural; but it can be very unpleasant if it is untrue. We have all squinted at the white glare of overexposed pictures, and we have suffered eye strain trying to identify dark underexposed pictures. Most unpleasant of all is to experience the extreme contrast of a too light picture followed by a too dark picture or vice versa.

Kodachrome does not have the latitude of black and white film nor does it have the advantage of automatic printing compensation characteristic of some black and white films. However, when exposed properly, Kodachrome has limitless possibilities for obtaining startlingly beautiful results. Therefore the question that concerns us is:—How are we to judge our exposure?

Inasmuch as artificial light, which is described in a later chapter, requires a different exposure guide and a different set of conditions, we will consider in this chapter only the influence of natural outdoor light.

The Exposure Chart

There are two popular methods of calculating the correct exposure. The first is by referring to the very useful chart enclosed in every box of Kodachrome, and the second method is to use an exposure meter. The chart will be an indispensable aid, if you do not have a meter. If you do use a meter, it would be well for you to study this chart, since it outlines concisely an excellent classification of light conditions.

Referring to a copy of this chart (fig. 5) you will observe that there are five classifications of weather conditions outlined and illustrated by corresponding sketches. These classifications, which include the period of time between two hours after sunrise and two hours before sunset, are as follows:—

(1) Bright direct sunlight.

(2) Weak, hazy sun, no distinct shadows cast.

(3) Open shade on bright day.

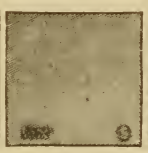
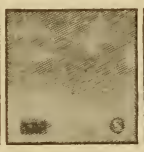
(4) Sky overcast, cloudy but bright.

(5) In shade on bright day.

The position of the subject is indicated by the letter "S".

(1) Bright direct sunlight: The sun is shining directly on the subject. There is no haze, and the atmosphere is clear. The sky is blue and there are no clouds except in some cases where there are small white clouds in the landscape and not between the subject and the sun. They are part of the picture and not part of the lighting. Usually they are equally as bright if not brighter than the clear blue sky. The basic exposure for average subjects

Daylight Kodachrome Exposure Guide

Bright Direct Sunlight	Weak, Hazy Sun; Soft Shadows Cast	Open Shade on Bright Day	Sky Overcast, Cloudy but Bright	In Shade on Bright Day
				

This guide is for the hours from two hours after sunrise until two hours before sunset; earlier or later, use a larger opening. Do not make Kodachrome pictures before one hour after sunrise and after one hour before sunset, except when making pictures of the sunrise or sunset.

Basic Exposure for Average Subjects	Between *f*.8 and *f*.11	Between *f*.5.6 and *f*.8	Between *f*.3.5 and *f*.5.6	Between *f*.3.5 and *f*.5.6	Between *f*.2.8 and *f*.3.5
Light-Colored Subjects	*f*.11	*f*.8	*f*.5.6	*f*.5.6	*f*.3.5
Dark-Colored Subjects	*f*.8	*f*.5.6	*f*.3.5	*f*.3.5	*f*.2.8
Side-Lighted Subjects	Bet. *f*.5.6 and *f*.8	———	———	———	———
Back-Lighted Subjects	Bet. *f*.3.5 and *f*.5.6	———	———	———	———

In direct sunlight, a flat lighting (light falling directly on front of subject) is best.

Dark-colored subjects include dark foliage, deep-colored flowers, dark animals, buildings, and similar subjects.

Light-colored subjects include snow and beach scenes, light-colored flowers, subjects with blonde complexions, light-colored buildings, and other subjects of a similar character.

Average subjects combine dark and light objects in approximately equal proportions.

Landscapes are best if taken in direct sunlight.

The above guide should be followed for both close-ups and distant views; special attention, however, should be given as to whether the subjects are of average brightness, or dark- or light-colored.

When in doubt, use basic exposure.

This guide is for both temperate and tropical zones.

This guide should be used for both kinds of Kodachrome Film, Regular and Type A. With the Kodachrome Film, Type A, be sure to use a "Type A Kodachrome Filter for Daylight" in front of the lens.

Figure 5

of this group will be between *f*8 and *f*11.

(2) Weak, hazy sun, no distinct shadows cast: The sun's disk is distinctly visible, but is shining through haze or weak clouds. A good characteristic of haze or thin clouds (where the sky is not part of the picture) is that they diffuse the light on subjects. This is a satisfactory light for Kodachrome since it tends to eliminate all harsh shadows and produces more uniform illumination on all surfaces of the subject. The basic exposure for average subjects of this group will be between *f*5.6 and *f*8.

(3) Open shadow, bright day: The day is bright and sunny but the subject is located in the open shade. Although the shaded subject is not exposed directly to the bright light of the sky and this shade is not so dark as that described in group 5. The basic exposure for average subjects in group 3 is between *f*3.5 and *f*5.6.

(4) Sky overcast, cloudy but bright: In this case the sun's disk is obscured by clouds, but the clouds seem to diffuse a bright light. The basic exposure for average subjects of this group is between *f*3.5 and *f*5.6.

(5) In shade on bright day: This condition differs from that of 3 in that the shaded subject is not exposed to an open sky. It is what might be described as an all-shade picture since there is shade on all subjects. However, the exposure for average subjects of this group is between *f*2.8 and *f*3.5.

The chart also describes the variations for side-lighted and back-lighted subjects. The intelligent use of an exposure meter together with a little experience will aid the photographer in interpreting these conditions.

Colors and Exposure

Now that we have considered the influence of sunlight conditions on the exposure let us next consider the influence of colors. The general color tone of the subject is a very important factor. Light colors and light shades of colors such as yellow and the pastel tones reflect much of the light on them. Medium colors and medium shades of color reflect and absorb an average amount of light, and the dark colors such as dark red and purple absorb a large amount of light falling on them. Therefore, referring back to the diagram we observe that the next two classifications to consider demonstrate the relative influence that color tone has on the reflection and absorption of light. In general, dark color tones or dark-colored objects such as dark foliage, dark animals, dark clothing or anything with dark coloring, will require at least one full stop more opening than a light-colored object, the light conditions being the same. Light color tones include light objects such as snow and beach scenes, light-colored clothing, pale flowers, granite or other light buildings, or any other light-colored objects.

Medium color tones appear in a scene with all medium colored objects such as a patch of flowers. The classification of medium color may also describe a scene where there is an even amount of light and dark colored objects such as a wide open park or street scene or a group wearing miscellaneous dark and light costumes. In order to classify your scene as dark, medium, or light, it is necessary for you to study your picture long enough to decide what proportion of strong and weak colors constitute your scene.

The Exposure Meter

The second, and more accurate, procedure for calculating your exposures is by using an exposure meter. This instrument registers the intensity of the light reflected from objects within its angle of vision usually in terms of lens opening and shutter speed—on the basis of a given film speed. However, you must use your meter intelligently, and take into account conditions which will influence your results.

The meter should register the light reflected by the principal objects in the picture. Don't wave the meter blindly in front of the camera. Point it as direct and close to the important subjects as possible. To illustrate let us consider a practical example. Given a group of skiers frolicking in the snow. (a) If you want closeups of their usually shaded faces, expose for it by holding your meter about six inches from their faces. (b) If you should like a medium shot with emphasis on their colorful ski clothes take a reading close to their clothes and place your camera for a medium shot. (c) If you wish to take some snow landscapes showing the skiers only as small silhouettes, point the meter directly downward to determine the intensity of the light reflection on the snow. (d) If you wish to show two-thirds blue sky, point your meter towards the sky but away from the sun so as to get a reading of the blue sky.

Do not allow the sun to shine directly into the meter and thereby affect the results. To prevent this, shade the meter with your hand. In photographing average landscapes you can get a better reading of the mountains

and other relatively inaccessable objects in the landscape by directing the meter to nearby foreground objects of similar coloring)and lighting. This is especially true when taking telephoto shots. Although our first rule in determining correct exposures by means of a meter is to direct the meter directly on the subject or on similar objects, we must keep in mind the harmony of the entire picture and oftentimes, as will be explained later, we must compromise in order to obtain the desired effects.

Experimentation

At this point the author wishes to emphasize the importance of taking at least one test roll of film. Number your scenes and keep your complete data. Check your results with your data. If you cannot get up enough courage to "waste" a roll of film, there is another kind of check you can make. When you take your next pictures, follow each scene with two experimental shots of the same picture. Take one-half foot at the next stop larger and another half foot at the next stop smaller than your standard exposure—especially with shots that you are in doubt about. Then, if your results are not satisfactory on the long strip you will be able to make comparisons with the accompanying short test strips. Compare your meter reading with your results.

This interesting experiment will also check the accuracy of your equipment. Scientific experiments of the best photographic equipment, including camera shutters, lens diaphragms, and exposure meters have proven that they will normally vary as much as one-third of a stop. Koda-

chrome exposures must be correct within at least one *f* value stop. Therefore, if two or more of your tools are inaccurate and these errors do not cancel, you must calculate your allowance to offset these inaccuracies. If you consistently over or underexpose using a film speed of Weston 8 try to change your speed to less than 8 or more than 8 respectively. However, these changes artificially to correct exposure merely compensate for equipment errors and should not be interpreted as representing actual changes in the film speed rating.

Don't forget that "a stitch in time saves nine". If you will "waste" a few feet of film now for experimenting and checking you may save thousands of feet in the future.

Painting with Light

Painting with light was very important with black and white film because so much of the quality of the picture depended on lighting effects. However, with Kodachrome, our first concern is to get enough light on the subjects. Also, many lighting conditions used for black and white film are not satisfactory for color. Therefore it is well to follow our chapter on exposure with a brief consideration of simple outdoor lighting effects.

With Kodachrome we get our best results from a soft flat lighting with the sun in back of the camera and only slightly to one side. With color, heavy shadows are dead and should not be photographed without the aid of reflectors. On the other hand, bright highlights will lose their color from overexposure and will produce an unpleasant glare. Although the picture should be illuminated as

uniformly as possible, we don't wish to rule out a normal balanced lighting where one side of the subject is slightly more illuminated than the other. Mild highlights and shadows can be photographed very satisfactorily.

Back lighting is debatable. Although the author has enjoyed some good results on certain types of back lighting, the beginner should apply it with care.

Those thin cloudy days—which robbed black and white pictures of all their contrast of lights and shadows—are ideal for photographing with Kodachrome. However, this cloudy condition is not favorable when taking scenes where much of the sky is included in the picture, because the white sky creates a glary back lighting. Beautiful blue skies are best photographed on a clear day.

A misplaced highlight or shadow can be distracting and unpleasant. If we are not careful in planning our shots, we may find that we quite unconsciously included very bright highlights which tend to "burn up" our color composition. These glary reflections will not only distract attention, but they will spoil the color effects. Very dark underexposed shadows may be equally unpleasant.

CHAPTER VI

INDOOR COLOR

Type A Kodachrome has many new thrills in store for you. The possibilities for colorful indoor scenes are endless. You can preserve intimate home movies of your family sitting around the fireside or you can photograph pictures of your business. With the necessary simple lighting equipment, filming with artificial light will be just as easy as filming out-of-doors. Type A Kodachrome requires no filter when used with Photofloods, but it is not advised for use with other types of artificial illumination. If you exercise a little patience and reasonable planning every color will be beautifully recorded.

Indoor Lighting

Indoor lighting and exposure are the important new points to consider in connection with Type A filming. However, indoor lighting is like many other tasks. You can go to no end of trouble complicating the job, or you can follow a few common sense rules and get excellent results with less effort and simple equipment. Of primary importance is plenty of light on all subjects. The lights used are the readily available and inexpensive Photoflood lamps, obtainable at every photographic store. Place them so that

the subject is equally illuminated on either side and in front. Artificial lighting should be planned so that light is diffused evenly and flatly over the entire subject. Remember that you cannot get results on Kodachrome with dark shadows in the picture. After a little experience you can play with back lighting and vary your side lighting so as to develop richer effects.

Since Type A is extremely sensitive to blue light, you must exclude all daylight. In other words you cannot photograph a mixture of daylight with Photoflood light. Incidentally, you can use Type A for daylight filming by placing a "Kodachrome Filter for Daylight" on your lens. This filter cuts out the excess of blue light. The speed will be exactly the same as of regular outdoor Kodachrome. If you have Type A film left over in your camera or if you are shooting a succession of indoor and outdoor pictures with only one camera, you can utilize this combination of Type A film for indoors, and Type A plus filter for the outdoors.

Although regular Kodachrome is slower for indoor work, you can use it indoors by making a similar adjustment. Add a "Kodachrome Filter for Photoflood" and allow two full stops for the filter. However, in addition to this allowance for the filter, you must compensate for the difference in speeds for indoor filming of the regular and Type A Kodachromes. If you are using a meter this difference will be compensated in your reading. Otherwise, reference should be made to the tables of indoor exposures. If you intend to vary your photography in this manner it

is more satisfactory to use Type A Kodachrome as all-around film.

Although it was stated above that flat lighting is fundamentally important for all color work it is not necessary to restrict your lighting effects in this manner. When you have mastered a simple technique you may try fancier lighting. Try concentrating the light on the principal subject, whether it be a face, a lamp, a vase, or any other feature. Simply add extra light to the subjects to be featured by placing lights closer or by adding more lamps.

Try side lighting by intensifying the lights on one side of the subject, after, of course, the front and the shadows of the other side are sufficiently illuminated for a satisfactory exposure. Backgrounds can be illuminated, especially when they are not too close to the subject, by placing additional reflectors close to the backgrounds. Never carelessly include the reflectors and stands in the picture.

Back lighting is also very effective. It must be stronger than the front light and it should be concentrated on the back of the subject. Although a spotlight is ideal for this, a reading lamp reflector will adequately serve the purpose.

Always remember to lay down your foundation of lights; then build up your highlights. Your general light is your foundation. After that, your side light will lend roundness and your back lights will lend sparkle.

Naturally lighted subjects are always pleasing. Interesting room effects can be obtained by placing Photoflood bulbs in floor lamps and wall fixtures. For the general source of room lights the author sometimes uses 1,000 wt. Photofloods. However, that increases the liability of blow-

ing fuses and it is usually necessary to "overfuse" beforehand. Blue bulbs and arc-lamps should not be used, because the pictures would be too blue. Always use lamps in reflectors except when you place them for special effects.

When using Photofloods it is important to avoid reflecting surfaces in the scene. Smooth surfaces such as glass, highly polished furniture, and light walls will reflect images of the lamps. Many an amateur has found on viewing his pictures that he included perfect images of his Photoflood lamps and reflectors in the picture. To avoid this, either remove the source of reflection or place the lamps in a different location.

Portrait Lighting

Portrait lighting is a subject about which volumes have been written. Although the thought of it may seem complicated, it is a procedure which cannot be avoided, even in the simplest amateur films. You are conscious of it when viewing pictures even if you don't give it much consideration when photographing. Briefly, the face should be illuminated so that one side is a little brighter while the other is molded with soft shadows. As previously mentioned, in addition to the front lamp one is placed on each side with one of these a little closer to the subject. In placing one light closer be careful that you do not "burn up" that side of the subject. In closeups the actor's face must dominate the rest of the picture. There is no set rule for lighting faces as no two are alike. For a good portrait, study your subject's features. Make the most of the good features

Exposure Table for Cine-Kodak Kodachrome Film using Kodaflectors and No. 1 Photofloods lamps*

Number of No. 1 Photoflood Lamps and the Distance from the Lamps to the Subject. The Distance should be measured or estimated carefully.	Kodachrome Film (Type A) for Photoflood Illumination	Kodachrome Film (Regular)	
	No Filter	With Kodachrome Filter *for Photoflood*	No Filter (Not generally recommended)
2 at 8½ ft. or 3 at 10½ ft. or 4 at 12½ ft.	*f*.1.9 Normal Speed or *f*.2.8 Half-Speed		*f*.1.9 Half-Speed
2 at 5½ ft. or 3 at 7½ ft. or 4 at 8½ft.	*f*.2.7 or *f*.2.8 Normal Speed or *f*.3.5 Half-Speed	*f*.1.9 Half-Speed	*f*.1.9 Normal Speed or *f*.2.8 Half-Speed
2 at 4 ft. or 3 at 5 ft. or 4 at 5½ ft.	*f*.3.5 Normal Speed or *f*.5.6 Half-Speed	*f*.1.9 Normal Speed or *f*.2.8 Half-Speed	*f*.2.7 or *f*.2.8 Normal Speed or *f*.3.5 Half-Speed
2 at 2½ ft. or 3 at 3½ ft. or 4 at 4 ft.	*f*.5.6 Normal Speed or *f*.8 Half-Speed	*f*.2.7 or *f*.2.8 Normal Speed or *f*.3.5 Half-Speed	*f*.3.5 Normal Speed or *f*.5.6 Half-Speed

*No. 2 Photoflood Lamps should not be used in Kodaflectors unless special adapters are obtained, see page 9; with these adapters, use half as many lamps as shown in the table.

The light from all Kodaflectors must be superimposed on the subject, thus restricting the area that can be illuminated successfully by a few Photoflood Lamps.

For very light-colored subjects use the next stop smaller, and for extremely dark-colored subjects use the next stop larger than given in the table.

NOTE: Do not use more than five No. 1 Photoflood Lamps on a single fused circuit; if six lamps or more are required, be sure to use different circuits. Do not use more than three No. 2 Photoflood Lamps on a single fused circuit.

Figure 6

and minimize the poor ones. Make-up is not necessary for Kodachrome.

When applying lights, caution the subject to look down for a few seconds to become accustomed to the bright lights. When making "half-speed" exposures, the subject should move slowly, or the action on the screen will appear rapid and jerky.

Indoor Exposure

Again we have the choice of referring to a table (fig. 6) or using an exposure meter. If you carefully carry out the instructions outlined in the exposure table for Photoflood lamps and reflectors, you will obtain satisfactory results. Note that the light from all reflectors must be superimposed on the subject in order to be counted in the numbers referred to in the exposure table. However, using the meter, as outlined in a previous chapter, you can get an accurate reading of any part in the illuminated field, directing the lamps according to your desired lighting effect.

Reviewing three fundamental rules for using a meter, (1) know the speed of the film, (2) direct the meter so that it gives you the reading for the subjects you are photographing, and (3) protect the meter from the direct sources of light by shading it.

CHAPTER VII

CONTINUITY AND EDITING

No matter how simple or personal amateur pictures may be the application of continuity with good editing improves them many-fold. Many amateurs think that their personal movies are not worthy of this procedure. However, it is very easy to weave a little so-called story out of the simplest conglomeration of family pictures, and there are many simple and satisfactory procedures. If you already have a collection of odds and ends of family shots, you might organize them according to the sequence of the time that they were taken. You might call the picture "Baby Grows Up" and feature the pictures in which baby is the leading character. Of course the best method is to plan some sort of organization beforehand. For example the same type of family movie could be called "The Smiths at Home" and the photographer could open the picture with a long exterior view of the house. This would be followed by semi-closeup and closeup shots of the house and the family in the garden. Then the photographer could move into the house and take a series of intimate closeups of members of the family in characteristic action. The same procedure could be followed on a vacation trip and some character or group of characters could form the basis for an interest-

ing continuity. Additional suggestions for both personal and semi-commercial pictures are described in the chapter on "What to Photograph".

Pictures having continuity and good editing will not only mean more to the family but they will also be more enjoyable to the family friends who will undoubtedly be invited to see them. The photographer will not need to apologize to his audience for the jumbled-up, misplaced sequences of the baby on the porch, the family at the beach, father's downtown office, and the family's vacation trips.

Organizing one's films is not a difficult thing to do. It is merely a matter of making a few simple titles and putting the sequences together so that they make sense. Although this chapter presents a few suggestions for planning continuity and editing there is no set rule. Originality is of primary importance, especially with personal films.

Building Up Interest

The most important principle to keep in mind is to build up the interest, not only of the entire film story but for each individual series of scenes. For a practical example consider the above mentioned picture, "The Smiths at Home". It will be easy to start with the outside movies of the home and by means of a series of pictures of the house, the garden, the family at work, and the family at play, work up to a climax which might include indoor pictures of an open-house party where the family are entertaining a group of friends. However, this same principle must be carried out in regard to the individual groups of

scenes. A fundamental principle applied here is to start with long shots and work into closeups. Never start with the intimate and detailed closeup and follow it by less interesting long shots. First we will photograph a long shot of the house and then perhaps we will get semi-closeups and then closeups of the house and surroundings. Figures should be introduced wherever possible. Let us use the same procedure for the garden by shooting some long shots followed by semi-closeups of flower patches, etc., and finally closeups of telephoto portraits of the individual flowers. The family and especially the children may be included in the long and semi-closeup shots. Then the family will enter the house and perhaps the dog will be there to greet them. We can include a few shots of the dog and the children on the front porch. The indoor series may include mother in the kitchen, the children in the playroom, father in his study, and other characteristic actions of the members of the family. Finally we can climax the picture with a jolly children's party or, as mentioned above, an open-house reception. This series does not have to be taken at any one time. The pictures can be taken and collected over a long period of time. They will mean something to the family and their friends when the collection has been completed. If one member of the family is especially comical or has any other interesting characteristics, he may be featured to help improve the continuity. Another satisfactory procedure is to use a "Time Marches On" idea and present the family activities in a form of a news reel. This gives the photographer the opportunity not only to organize and edit movies of his

family activities; but it also presents an opportunity for him to date them.

Vacation Trips

Many amateurs think that the above mentioned informal type of pictures is the most difficult one to organize. On the other hand, family picnics, vacations and other types seem easier to edit. If the photographer keeps in mind a building up of the interest he can simply edit the events as they happen. Travel pictures should include good scenics with people or other figures in the foreground and many shots of out-of-door activities. Don't let your people assume a "see the birdie" pose. They should be engaged in normal action or they should be directing the attention to the important interest in the picture. Continuity can be preserved by: featuring one or more of the characters, by showing the automobile, train, or ship between scenes, or by using appropriate titles. For title backgrounds many people have used colorful travel folders, ship scenes, railroad trains, automobile wheels, and other similar objects that suggest motion from one place to the next. In such limited space it would be impossible for the author to begin to describe the many procedures for creating appropriate continuities. The author is confident however that if the photographer studies his already photographed pictures carefully, or better yet, if he takes his pictures according to a definite plan, many original ideas will come to his attention. The most important point is to become continuity minded and the pictures will show the results.

Regarding mechanical aids, the use of fade-outs, dis-

solves, slow motion, and different focal length lenses as described in another chapter, will also improve the continuity.

Titles present a great field for the application of original thought. Titles should build up the picture rather than detract from it. This means that they must not only be in harmony with the subject matter but they should not be too conspicuous and there should not be too many of them. For example in a poorly photographed picture of the American Indians, perfectly exposed color titles with bright Navajo blankets in the background would detract from the picture. The simple purple haze titles would not be so apt to detract from these scenes. On the other hand, if the pictures were perfectly exposed these Navajo blanket title backgrounds would add considerably to the beauty and interest of the film.

The titles should blend in with the picture. If the movie is formal, the titles may be formal; and if the movie is informal, the titles should be likewise. A favorable impression is usually made by good opening titles. They may be hand lettered and superimposed on a still picture or preferably a moving background. For example, the opening titles of "A Trail Song" are superimposed on a silhouette of a moving pack train. Each title dissolves to the next. The subtitles should be much simpler than the opening sequences.

Trick Titles

Many mechanically-minded photographers like to make elaborate "wipes" and other trick titles. Although these

are very effective, they will require a great deal of time and patience to make. One must be careful that they do not detract from the picture. They are very satisfactory for well edited industrial or commercial pictures, but do not harmonize with many informal family or scenic pictures.

Direct and Superimposed Titles

There are two simple procedures used in making titles. The simplest way is to photograph letters on a title board or on a title which has been photographed, printed, or sketched. This is merely a matter of setting-up the camera in such a way that it includes the area of the title in its field. If photographed indoors, Photoflood lamps are used to illuminate the title, and the exposure meter or the Photoflood exposure table will indicate the correct exposure to use. Having photographed the titles and having sent them to the processing station for development, they are ready to splice into the film.

The other method which has all kinds of possibilities is to superimpose the titles on either a still or moving background. The procedure involved is to photograph the picture whether it be a still or a moving background and then rewind the film in a dark room and photograph the lettered titles on the already exposed but undeveloped background. If the background that the photographer wishes to use is a developed film, he can have an undeveloped duplicate made and run the duplicate through the camera while he is photographing the printed titles. Although the procedure of superimposing titles may appear

to be complicated, it is very simple. However, it is very necessary that the photographer keep accurate footage readings in the event that he uses many different backgrounds in one reel. Also the background should be a dark, slightly-underexposed subject so that the letters will show up more clearly. If Kodachrome titles are made with Photoflood lamps, the indoor Kodachrome film is used without a filter. Purple haze is a colored base positive film that lends itself very well to Kodachrome pictures. Other color tints are available but the purple haze is the most popular.

Many types of titles are made to order by various title services. Some are typewritten, some are printed, and some are hand-lettered. If the amateur does not have the time or the desire to make his own original titles, these commercial titles will be very satisfactory. For the making of "homemade" titles commercial title boards are valuable aids. Better yet, it is very easy to construct a title board which will make it possible for the photographer to standardize on any size title that he wishes to copy.

Length of Titles and Scenes

One hundred foot reels should average about one main and three secondary titles. Longer films will require a proportionately larger number. Not only should the amateur guard against an excess of titles but each title should not be too long. Although the average printed title card will accommodate about twenty words of average length, a title of this length should be exceptional. Each title

should be as short as it is possible to make it with no sacrifice of clearness. Some of the daringly long titles listed in the musical score of "The Trail Song" in the chapter "Color and Music" are the exception rather than the rule. Words should be well chosen, and too personal or trite expressions should be avoided.

Titles should appear long enough on the screen for the photographer who is familiar with them to read them through twice. This is the time suggested to give the average audience time to read them once. This, of course, does not include the time consumed for fade-ins or fade-outs, if that technique is used. While on the subject of timing we should consider the time of the pictures. Many amateurs make the mistake of taking scenes that are too short. The first time the films are reviewed the photographer should immediately discover his obvious mistakes. Others will let the scene continue until the spring runs down. There is no set rule as to the exact footage that should be consumed during the filming of a scene. This time depends entirely on the nature of the picture. If there is a lot of activity to observe, the scene should naturally be longer and the opposite is true of scenes of less activity. It is better to run shorter lengths of subjects with not too much activity than it is to run long scenes of much confusing activity with no concentrated interest. Here again if the photographer is keen on judging his films he should learn by very little experience how to plan the length of his scenes. Perhaps the most common example of a too-long scene is one where the action such as an approaching automobile starts far away from the camera

and approaches very slowly so that the interesting part of the picture is not reached until the film footage has already been one-half to two-thirds wasted. For this approaching automobile and the following semi-closeups and closeup shots the film should be proportioned according to the degree of interest of each of the shots.

System in Editing

If you were to visit Hollywood you would notice that a number of "daily takes" are photographed and later projected. The best shots are selected from these and are then organized into the film that you see at the theatre. The finished titled and edited story is the result of what had been a miscellaneous and apparently meaningless collection of shots.

In editing films system is of primary importance. Although editing is a very simple procedure many amateurs take much more time than should be required. This lack of system not only wastes time, but the confusion often discourages the photographer from any additional activity in organizing his films.

Photographers with different kinds of home or laboratory accommodations will no doubt work out their own satisfactory procedure. Essentially the important point is to have some means of splicing out and labeling the individual scenes so that they may be organized according to a written or unwritten scenario. The following is a description of the system that the author finds convenient for home procedure. The equipment used is as follows: small film compartments (book shelves protected by glass

doors are very satisfactory), projector with reverse action, small screen, viewer, cards for labeling, dry splicer, paper clips, and empty one hundred foot reels. The unedited film is reviewed by projection and the scenes are classified, reeled, and placed in labeled compartments. In the event that these small compartments are not available, the amateur will find that dust proof shelves or the tables in an undisturbed room will be satisfactory for laying out and labeling the films. Each label is given a number. The viewer and splicer are conveniently placed beside the projector on the table where the photographer is working. Although some people can do all of their editing work with just a viewer, the author prefers to select his films while projecting them on the screen. In fact with Kodachrome he often works in a big room where a large image can be projected so that the true color quality of the individual scenes can be determined accurately. The author uses the viewer only to determine the exact spot where a film should be cut. Regardless of how much film has been used in shooting the scene all but the unessential footage should be cut out. Don't be afraid to "waste" this film. After you have once photographed unnecessary "before and after" footage, whether or not it could have been prevented, the film has already been wasted. By refusing to cut these non-essential portions, you simply advertise your mistakes. A certain amount of waste is unavoidable especially when shooting pictures where it is impossible to judge where the action is going to begin or end.

In handling Kodachrome film be very careful not to

damage it with finger marks. If possible, hold it by the edges. Also, in placing clips on the film protect it with folded paper so that the clips do not scratch. After you have projected your film on the screen and have spliced out and classified your selected shots then refer to your scenario and splice the films together in their numerical order. Now, each compartment contains a strip of picture film or a title with a label and number. All that remains to do is to splice them together according to their numerical order which corresponds to the scenario.

In splicing Kodachrome it is advisable to remove the bluish-green coating which is left on the film base after the emulsion has been scraped away.

If the photographer has made his pictures in a fairly normal sequence, it is not necessary to go to the trouble of detaching each scene. Often times it will be necessary to rearrange only a few of the shots. In this case the film is run through the projector and only the misplaced scenes are removed. The film is rewound, and the misplaced shots together with the titles are spliced into the reel during the second projection.

Finishing Touches

After the photographer has projected his films half a dozen times he may notice additional changes to be made. These changes will not take much more time and will undoubtedly smooth out the continuity of the film. Having projected the films many amateurs complain that their splices do not hold. The author's experience has proven that a satisfactory splice is practically as strong as an

unspliced film. However, if breaks in the film occur there are two probable causes. One is that the splice has been made improperly, and the other is that the projector is not in satisfactory running order. However, it is just as easy to make a good splice as a poor one. If you have checked your splices and are sure that they are perfect then you should have your projector checked.

CHAPTER VIII

PROJECTION

Taking the picture is only half of the story. Many amateurs will go to no end of care and expense in taking pictures and then ruin their excellent results by faulty projection. Every detail of planning a performance should provide for the comfort and enjoyment of the audience. Don't ask the audience to tolerate your movies; make it enjoy them. Don't apologize with a lot of alibis. Correct your faults and perfect your projection technique You and your audience will profit by this additional effort.

There are several satisfactory makes of projectors. When properly operated all produce good results. Complete instructions are furnished by each manufacturer. Familiarize yourself with your projector. It is a simple machine and you will find it easy to operate.

Care of Projector and Projection Technique

Assuming that the finished film is properly cleaned and correctly spliced, as directed in a previous chapter, you are ready for a show. Set the projector on a firm base. A wobbly bridge table or a weak chair will not stand the vibration. Apply a few drops of oil. Failing to do so may ruin its mechanism. On the other hand, too much

oil may harm the projector and spatter on the film.

Cleanliness is an important factor. Wipe both sides of the lens and condenser with lens tissue or soft cloth to prevent picture blur. Occasionally the reflector behind the lamp will also need cleaning and adjusting. Clean the film gate, since it has a tendency to collect particles of dust and film emulsion which not only produce "dust frames" on the screen image but which will eventually harden from the heat of the lamp and scratch the film. A small brush can be used to clean the gate, and if too much dust collects in the mechanism of your projector, take it to a local repair shop and have it properly cleaned. Always keep in mind that dust particles, scratches and other defects are greatly magnified when projected on to the screen. The author has reviewed pictures so badly scratched that they presented the appearance of a rainstorm on the screen image. Bad scratches are especially noticeable on color film.

Electrical Connections

Make sure that your electrical connections are safe and properly connected. Many projectors consume 1,000 watts or more, and your feed cables must accommodate this current. If you have a show away from home, bring plenty of extension cable. The large thick rubber cable is well insulated and does not tangle easily. Use a double or triple socket for a phonograph or sound connections. Conceal and protect the cords and sockets as much as possible so that members of your audience will not trip on them or break the connections. You might use an

auxiliary pilot light or a flashlight. If the projector has a lamp rheostat, set it at minimum amperage and warm it up before increasing.

Be sure that your reels are rewound and arrange them in the order that they are to be shown. It does not impress an audience favorably to delay the show by rewinding and fumbling with the films. Check the threading of the film according to the projector manufacturer's directions. Failure to do this may result in tearing the film.

Reduce Projector Noise

If you are a serious minded amateur you will enjoy supplementing many interesting features which will help to reduce projector noise. Cover the projector with a specially designed box or set up the projector in an adjoining room. Interesting little theatres which have projection rooms and all of the seating comforts of a large theatre have been built by some amateurs. However, the majority of us must make the most of our living rooms or social halls.

Screen

No less important than the camera or projector is the screen. Some amateurs use everything from walls to window shades. Equally unsatisfactory is the silver or glass bead screen that is badly discolored or damaged. The author has learned by experience to carry with him his own complete equipment at all times. Although a good silver screen is satisfactory for black and white films, the

glass bead surface is best for color projection. Any screen having a dominant hue of color will effect the results. Screens that have turned yellowish brown with age are unsatisfactory for color projection. For the average living room a three or four foot screen is adequate. If the room is too short, a one and one-half inch projection lens should fill the screen. Do not project too large a picture in a small room. Well exposed Kodachrome can be satisfactorily projected in large auditoriums on eight, ten, or even twelve foot screens. The author has experienced these results in auditoriums seating as many as 1,500 people. A 750 watt or 1,000 watt lamp gives ample light for such a show.

Other Projection Requirements

Color film is shown to the best advantage in a totally dark room. Cover all outside windows and turn out all other lights. Do not permit any illumination, such as a light from another room, to reflect on the screen. For the same reason discourage people from entering or leaving the room during the show. An open door may throw a light on some of your best color shots. Seating should be handled before the show begins. Locate yourself near the projector and check the focus at all times. If your projector has a rheostat, you can cut down the light on overexposed pictures and vice versa.

If your projection lamp has turned dark or if you know it is about ready to burn out, insert a new one. (Save the old lamps for editing or for black and white projection). The Kodachrome dyes do not match well with an old

lamp. You will notice that the light becomes reddish. The same is true of a lamp that is burning at a temperature lower than its rated voltage. Therefore, it is advisable to check on your lamp and on your line voltage from time to time.

Always keep in your projector case, a can of oil for lubrication, a spare lamp and extra projector cables for emergency changes. When the show is over return the projector to the case after it has cooled to prevent condensation.

No less important than organizing your program is organizing your equipment. If possible, use a special grip or box for sockets, plugs, cords, records, needles, and any other essential or emergency equipment that you might need. Know where everything is. Use cords that don't tangle easily and keep them neatly rolled up when not in use.

CHAPTER IX

COLOR AND MUSIC

Color and music, what a delightful combination! Have you ever tried interpreting a beautiful color scene with an appropriate musical recording? On the other hand, have you ever selected a musical poem and photographed an appropriate picture for it? If you have not done so, the author believes you have missed one of the real thrills of programming colored pictures. The two emotional appeals: color and music, can be combined in an exquisite symphony of picture and sound.

"Homemade" Sound Equipment

Offhand, one might be frightened away from the idea, thinking that the sound equipment might be difficult to use and expensive to set up. On the contrary, if the following procedure is used, it is just as easy to set up the sound equipment as it is to connect a projector. Three items are all that you need, i.e., a pick-up, a radio, and a long cord to connect the two. Several radio manufacturers produce a small portable-type phonograph pick-up which sells for approximately the price of two rolls of Kodachrome film. This compact machine consists essentially of an electric turn table which revolves the record,

a tone arm, and a long cord that connects the pick-up with the radio. Most modern radios are already equipped with an attachment for the phonograph connection. Others may be rewired at small cost. In order to set up your "homemade" sound machine, you simply plug the pick-up power wire into an ordinary house current outlet, preferably into a double or triple socket into which the projector is also plugged. Then attach one end of the sound wires to the pick-up and the other end to the radio. If you use a longer wire of desired length instead of the short standard wire provided with the pick-up, you can conveniently operate your turn table at the projection table and place your radio near the screen. For home shows, the large living room radio can be utilized very satisfactorily, but for traveling purposes the author has used and recommends the medium size portable radio. It is convenient to carry in the hand and it is easy to transport in the automobile. Whether you use your own radio or find it necessary to purchase an extra radio for portable purposes the entire cost of the equipment is reasonably low.

Selecting Music for Pictures

It has just been mentioned that there are two interesting methods of handling pictures and music. The first method is to select the music for the pictures, and the second method is to photograph the pictures for the music. Most amateur photographic activities will fall into the first classification, so we will consider that procedure more in detail. Since the realm of music includes such a great

variety, varying from the simple hill-billy songs to the great master works, it would be impossible in this brief description to include more than a few practical examples. The photographer will therefore experience the interesting task of selecting the accompaniment which he thinks carries out the mood of his own films. Many people who are fortunate enough to have acquired a good musical education may be able to decide offhand what music they require. Others will find it helpful to read music synopses in the many excellent reference books and then study these selections by playing phonograph discs from the great record libraries. These libraries contain works which will describe any motion picture mood.

Before we review a few practical examples of color and sound it will be well to consider a few simple fundamental rules governing the use of this combination. Always remember that your purpose is to build up the picture. Therefore, the music should never detract in any way from the film. For the most part select the kind of music that is commonly called "background music" which usually constitutes a gentle flowing accompaniment and contains no dramatic changes of tempo or volume. This is especially true for the very popular and enjoyable scenic pictures. Selections such as the "Swan of Tuenella" and excerpts from Beethoven's "Sixth or Pastoral Symphony" are examples. In fact the author used the first movement of Beethoven's Sixth, "Awakening of Cheerful Feelings on Arriving in the Country" as the introduction to "A Mountain Symphony". You can check on the mood of the musical score by testing it on yourself or on your

friends. The audience should not be very conscious of the musical background. Except for comical moods the author does not recommend the use of very familiar or trite selections such as "Hearts and Flowers" for beautiful subjects. The audience may associate that selection with the old-fashioned "Nickelodeon" melodrama or some similar humorous situation. For a flower subject lovely background music such as "Forest Murmurs" from "Siegfried", or "Waltz of the Flowers" from Tschaikowsky's "Nutcracker Suite" or "Midsummer Night's Dream" will be more appropriate.

For your foreign trip there is a wealth of international music available in your local record libraries. It should be very entertaining to select these musical moods following such a trip. The author has not yet had the opportunity to go on a world tour, but in his new picture "Around the World in San Francisco" he has selected musical scores for the scenes of the various foreign quarters of that cosmopolitan city. For your trip to Mexico film there will be many interesting Spanish and Mexican recordings available. You should not play too many lively tangos throughout the entire film. For certain Mexican scenes the livelier Mexican music will be very appropriate, but for the more conservative scenes use selections such as "Capriccio Espagnol" for the opening shots, "Parsifal" for the church scenes, "Bolero" for the Aztec Indian ruins and incidental tone poem background music for the beautiful scenics and colorful sunsets.

For your film record of your favorite college including perhaps a "big game" at the stadium, the university

marches and college songs will liven up the spirit of the program. Likewise, the music for your movies of local jubilees, parades, and other celebrations can be of a livelier spirit. For your informal pictures, especially those of the family, you will have innumerable possibilities for creating most any kind of mood. Your opportunity for comedy effects is especially evident.

Musical Score for "The Trail Song"

In order to present a practical example of a complete musical score the author will describe briefly his latest colored movie, "The Trail Song", and the musical score which he is using for this film. Briefly, "The Trail Song" is a boys' packtrip into the California High Sierras. The picture includes interesting shots of camp life and the country visited. This film is a rather formally presented color and tone poem with very little comedy. It features the educational aspects of such a camping trip. Carrying out this idea, the titles are quotations selected from poems of nature. The author's explanatory dialogue supplements the musical effects.

The explanatory chart is divided into three columns, the first of which describes the pictures. Although the original work sheet lists every scene in detail, the following chart merely summarizes the general series of scenes. The second column describes the titles and the third column lists the background music. In the music column the selection continues until a new one is listed.

In detail, the following chart merely summarizes the general series of scenes. The second column describes the titles and the third column lists the background music. In the music column the selection continues until a new one is listed.

Musical Score for "The Trail Song"

Pictures	Titles	Music
Opening titles are superimposed on moving background of boys and pack burros silhouetted against the sky.	Art Titles CLIFFORD NELSON presents — THE TRAIL SONG — Opening Quotation "A song for the trail Through gorge and swale, That leads to the giant hills."	"Beethoven's Sixth Symphony" —(The Pastorale). Beginning of the first movement.
Hikers leaving San Francisco on truck. Scenes en route to Yosemite.		Philadelphia Symphony special recording of "Stars and Stripes Forever".

Pictures	Titles	Music
Opening scenes of Yosemite Valley.	Quotation "We sauntered up the valley in the company of these majestic rocks."	"The Swan of Tuenela"—Part II.
Animal pictures: bears and cubs, deer and birds.	Quotation "Oh gracious cubs Tiny souls— Soft and furry— Ever bold."	"The Whistler and His Dog". "The Warbler's Serenade".
Packing animals and leaving for high mountain trail.	Quotation "A wild heigh-ho— To the vale below! Life sings In the giant hills."	"Grand Canyon Suite".
Great waterfalls of Yosemite.	Quotation "A burst of molten silver— Born of mountain snow"	"Water Music Suite"—Handel.
Intimate waterfall pictures, featuring closeups and slow motion shots of water comets, and waterfalls.	Quotation "Like a torrent of massive comets"	"Tod und Verklarung"—Part 6 for violent water shots.

Pictures	Titles	Music
	Quotation "Ceaselessly pouring A thunderous roaring"	
Camping, swimming, etc., on sandy shores of Merced River.	Quotation "Breathe deep the air— So clear and rare, Breathe deep The joy that thrills."	"Beethoven's Sixth Symphony" —Part IV.
Spectacular climb up Half Dome: great granite rock.	Quotation "In the big world— How small a thing is man."	"Morning, Noon, and Night" Overture—Middle of Part II.
"Kentucky Derby" with boys humorously riding burros.	Quotation "Get along little burro, Get along."	Racy music in last third of "Orpheus in Hades"— Part II.
Boys and burros on winding trail again—granite cliffs—high peaks, and pleasant streams.	Quotation "I love thy rocks and rills Thy woods and templed hills."	"Beethoven's VII Symphony".
Series of mountain wild flowers.	Quotation "Flowers. How they whisper among themselves Telling secrets Man will never know."	"Waltz of the Flowers"— "Nutcraker Suite".

Pictures	Titles	Music
Camping beside a lake series—swimming, sun bathing.	Quotation "Vision of mountain beauty, Deep-shadowed, motionless A jewel in a granite setting."	"Les Preludes"—Part III.
	Quotation "Beside the lake Beneath the trees."	
Fishing—frying, and later eating a mess of trout.	Quotation "Let me cast the feathered hook across the pebbled brook."	"Midsummer Night's Dream".
Series of flaming red campfire shots.	Quotation "There drifts the incense from the piney fire."	
On the trail again. Boys concentrating on awe-inspiring mountain ranges.	Quotation "A great peace hangs over earth and sky."	
More burro trouble—burros refuse to cross bridge.	Quotation "Haw-w-eek Haw-w-eek"	"Grand Canyon Suite".
Trail through high mountain meadows with more studies of alpine flowers.	Quotation "The meadows are flowery lawns."	

Pictures	Titles	Music
Climbing a peak. Boys make "snow ice cream", walk over a glacier and finally reach the top of the snow-capped peak. The mountain climb ends with intimate pictures of the surrounding peaks with telephoto shots and the last of a series of beautiful sunsets.	Quotation "Climbing higher, higher, new beauty came streaming on the sight." Quotation "Nevermore need one weary, Or faint by the way Who gains the blessings Of one mountain day." Quotation "Pure luminous colors fighting The silent shadows to the last."	"Prelude to Act III"— "Lohengrin". "Tannhauser"—"Overture and Venusberg Music".
Moving. Silhouette background of boys and burros again.	Quotation "The Trail Song is ended, But the memories will linger on."	"The Enchanted Lake".

The last title "The Trail Song Is Ended, But The Memories Will Linger On" is superimposed on the boy and burro silhouette background. The picture ends with this last title fading from the background; then the background fades away and finally the tone poem music "The Enchanted Lake" fades to close the program.

Our first rule was to select the kind of music that blends well with the motion picture. The next rule is not to play the music too loud or too softly. Many people dislike hearing the music played with too much volume. It is very disturbing to them and this may completely reverse their appreciation of your picture. On the other hand, you want them to hear the music. Study the size and the acoustic properties of your room or auditorium and adjust the volume accordingly. You will recall that the set-up provides for the placement of the pick-up on the projector stand. Here it will be possible for you not only to watch your projector but also to control your sound volume by means of an adjustable control on the pick-up. You can tone down the music when the record is too loud and also when you wish to make a few explanatory comments. Likewise you can turn up the volume when the mood of your picture requires louder music.

If you are handy with electrical equipment, or you find it economically possible to invest in a small public address system, you can organize a musical and dialogue sound system that will make it possible for you to superimpose your explanation of the picture on the musical background. For many persons this arrangement is even better than the sound on film equipment because the speaker

can vary his explanatory dialogue according to the interest of his particular audience on different occasions. For example, on one occasion the author may be presenting one of his outdoor pictures to a hiking club where their interest centers around the story of the trip itself. On another occasion the audience may be school children who are interested in camp life, camp organization, and animal stories. On other occasions the audiences may be interested in such subjects as recreation and juvenile delinquency, natural history, garden club activities with emphasis on wild flowers, geography of the state, or general entertainment. The flexibility of this loud speaking arrangement makes it adaptable to all audiences.

Although many speakers can present an extemporaneous dialogue very satisfactorily, the pictures move so rapidly that most speakers will find a written outline very helpful. This means of course that organization of equipment on the projection table is essential. Records should be stacked and marked in their consecutive order. The descriptive outline should be illuminated and all necessary equipment should be close at hand.

Play only those parts of the record which you desire for the pictures. It is not necessary to start the needle at the beginning of the record. If you cannot remember exactly where the selected part is located on the record, mark it with white pencil or adhesive tape. This procedure is mentioned because of the fact that so many classics such as those of Richard Wagner will describe a beautiful tone poem and suddenly burst into much more dramatic music, which deviation, although very entertain-

ing, will interrupt the mood. Number the records in the order to be played.

Of course, one must follow the simple rules of playing a phonograph. The records should be carefully handled and protected in albums. Needles should be in good condition. The long-playing needles are most convenient to use. The pick-up and the phonograph should be in good working condition so as to obtain maximum music quality.

The realm of music is so vast and the subjects that every amateur photographer might photograph are so numerous that it would be impossible in this brief treatise to try to present very much specific material on the subject. The author desires only to stimulate the photographer's interest concerning the possibilities. Not only will the photographer enjoy preparing and showing his films with music, but his audience, small or large, will compliment him on his delightful combination of color and sound.

CHAPTER X

KODACHROME FOR STILL PICTURES

Kodachrome is now available for several makes of 35 mm. miniature still cameras. Many movie enthusiasts will want to supplement their motion pictures with "stills". This film gives transparencies that have the full vivid color characteristics of cine Kodachrome. Still cameras have the added advantage of variable shutter speeds so that you can shoot your picture in some cameras at speeds ranging from 1/1250 of a second to as long as you like, while cine film usually runs through the motion picture camera at a speed of 16 or 24 frames per second giving shutter speeds of 1/30 to 1/50 of a second, except in some makes of multi-speed cameras where the exposure can be varied by changing the speeds. However, this changes the normal speed of the subject. Therefore, the advantage of varying exposure with still cameras presents new opportunities for the color photographer.

Full color images can be projected on a large screen or they can be viewed in their original size by transmitted light. They can be reproduced in color for illustrative purposes. Also, excellent black and white enlarged pictures are made from miniature Kodachrome films by making an intermediate black and white negative and by

handling the negatives in the same manner as you would your black and white films.

At the present time Kodachrome is not available for any types of miniature camera except those using the perforated 35 mm. motion picture film, such as Contax, Leica, Robot, Cine-Exakta, Rolleiflex 35 mm. adapter, Argus and others. For those who wish a somewhat larger picture than these miniatures give, the single exception to the preceding statement is recommended. The Kodak Bantam Special with *f*2 lens and coupled range finder is supplied with special short length Kodachrome cartridges which give eight exposures, each considerably larger than the 35 mm. "double frame" camera.

Loading the Camera

Still Kodachrome is furnished in small metal magazines in sizes to fit most of the 35 mm. miniature cameras as well as the Kodak Bantam Special. For the Robot and other cameras using special magazines, the film may be removed from the regular magazine and loaded into the special one, returning it to the regular after exposing. This can easily be done in a changing bag or dark room. Although you will find the exact instructions for loading your make of camera in each box of Kodachrome, there are a few general instructions to keep in mind. The construction of the film magazine permits an easy loading and unloading in subdued daylight. However, as in cine Kodachrome, never do this in direct sunlight or in very strong artificial light. Since it is possible for light to leak through the slot, never allow the magazine to remain unprotected.

Keep the small aluminum box in which your film is packed so that you may use it as a container for mailing back to the processing station. Wind your film far enough to record your first exposure, and don't wind it too far when making your last exposure and do not make more than 18 exposures on one film. These specific instructions will vary for different types of cameras. After taking your last picture, rewind the film on to the original film spool and when you feel no tension, give the spool a few extra turns. Open the camera and remove the film magazine. Without delay return it to the processing station for developing.

Learn the "feel" of tension when winding your film although this will not happen more often with Kodachrome than with ordinary film. If complications arise, open the camera in a dark room and make adjustments. Also, if you have exposed only part of a roll and wish to switch film, note the number on your film indicator, and proceed to wind back the film as though the roll were completely exposed, except that you must be careful to stop rewinding before the pull-out flap of the film recedes back into the magazine. If you are using a Contax or Leica camera you can accomplish this by rotating the rewind knob about half a turn after the change of tension indicates that the film has left the rewind spool. The Contax with two magazines or the Robot may be opened any time by sacrificing only two frames. With the Kodak Retina, listen to the clicking sound which indicates that the perforated or exposed part of the film is still winding back into the magazine spool. As soon as this click ceases, give

the rewind knob one complete turn and open your camera. If the flap of the film does not project out of the magazine, you have rewound the film too far and it will be necessary, when replacing it, to open the magazine in a dark room to draw out the film. After removing the film magazine, place it in the protective box and be sure to write the data on the box to prevent forgetting the number of exposures you have made. Your camera is now ready for a loading of any other film. When you come back to Kodachrome, load the camera in the usual manner, detach your shutter connection, and wind the film to the corresponding number on the indicator where you left off. You have already noted this position on your Kodachrome box.

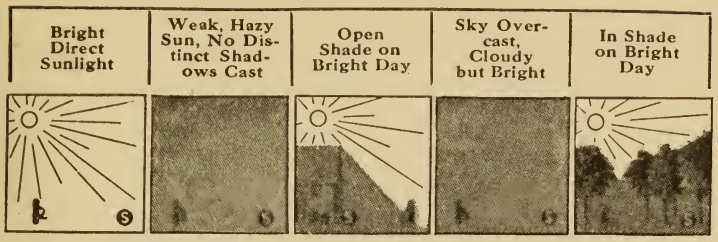
Don't neglect to watch your indicator. In loading, it is easy to forget to set your indicator exactly as instructed. Keep track of your film at all times.

Exposure

The procedure for judging exposures for still Kodachrome is similar to that described in connection with cine Kodachrome, except that you have another consideration —that of using different shutter speeds. Again you may use either the excellent tables, fig. 7 for outdoor pictures, and fig. 8 for indoor pictures, that Eastman Kodak Company has prepared, or you may rely on the exposure meter, or you may combine the advantages of both.

Similar to the previously described cine color chart, the "still" chart is divided into five classifications describing the general light conditions:—

Daylight Kodachrome Exposure Guide


Bright Direct Sunlight
Weak, Hazy Sun, No Distinct Shadows Cast
Open Shade on Bright Day
Sky Overcast, Cloudy but Bright
In Shade on Bright Day
S

This guide is for the hours from two hours after sunrise until two hours before sunset; earlier or later, use a larger opening. Do not make Kodachrome pictures before one hour after sunrise and after one hour before sunset, except when making pictures of the sunrise or sunset.

FOR CAMERAS WITH SHUTTERS MARKED 1/10, 1/25, 1/50 SECOND, ETC.										
	Stop	Speed	Stop	Speed	Stop	Speed	Stop	Speed	Stop	Speed
Basic Exposure for Average Subjects	Between *f*.5.6 and *f*.8	1/50	*f*.4.5	1/50	*f*.3.5	1/50	*f*.3.5	1/50	*f*.3.5	1/25
Light-Colored Subjects	*f*.8	1/50	*f*.5.6	1/50	*f* 4 5	1/50	*f*.4.5	1/50	*f*.4.5	1/25
Dark-Colored Subjects	*f*.5.6	1/50	Between *f*.3.5 and *f*.4.5	1/50	*f*.4.5	1/25	*f*.4.5	1/25	*f* 4.5	1/10
Side-Lighted Subjects	*f* 4.5	1/50	—	—	—	—	—	—	—	—
Back-Lighted Subjects	*f* 3 5	1/50	—	—	—	—	—	—	—	—
FOR CAMERAS WITH SHUTTERS MARKED 1/20, 1/30, 1/40 SECOND, ETC.										
Basic Exposure for Average Subjects	*f*.6.3	1/60	*f*.4.5	1/60	*f*.3.5	1/40	*f*.3.5	1/40	*f*.3.5	1/20
Light-Colored Subjects	*f*.9	1/40	*f*.6.3	1/40	*f*.4.5	1/40	*f*.4.5	1/40	*f*.3.5	1/30
Dark-Colored Subjects	*f* 6.3	1/40	*f*.4.5	1/40	*f*.3.5	1/30	*f*.3.5	1/30	*f*.3.2	1/20
Side-Lighted Subjects	*f*.4.5	1/60	—	—	—	—	—	—	—	—
Back-Lighted Subjects	*f*.3.5	1/40	—	—	—	—	—	—	—	—

(S) Subject

Do not hold the camera in the hands for exposures longer than 1/20 or 1/25 second.

In direct sunlight, a flat lighting (light falling directly on front of subject) is best.

Dark-colored subjects include dark foliage, deep-colored flowers, dark animals, buildings, and similar subjects.

Light-colored subjects include snow and beach scenes, light-colored flowers, subjects with blonde complexions, light-colored buildings, and other subjects of a similar character.

Average subjects combine dark and light objects in approximately equal proportions.

Landscapes are best if taken in direct sunlight.

When in doubt, use basic exposure (see guide).

Blurred pictures are often caused by failure to hold the camera steady during the exposure. If this difficulty is experienced, it will be necessary to use a faster shutter speed and correct the diaphragm stop accordingly.

Figure 7

(1) Bright direct sunlight
(2) Weak hazy sun, no distinct shadows cast
(3) Open shade on bright day
(4) Sky overcast, cloudy but bright
(5) In shade on bright day

The other classifications describe the compensations for dark and light colored objects and for side and back lighted objects. Although most 16 mm. motion pictures are shot at 16 frames per second, still exposures are not based on any one shutter speed. For taking pictures with the camera held in the hand, a speed of one-fiftieth of a second is very satisfactory. Most of the exposures listed in the table are described for that speed. For exposures longer than one twenty-fifth of a second it is not necessary to use a tripod. For pictures of fast moving objects shorter speeds such as 1/100 or 1/200 etc., will tend to stop the motion. Some miniature cameras are equipped with much higher speed shutters. When using these extremely short exposures, it is advisable to calculate your data on an exposure meter. Modern meters are so constructed as to give information at a glance. You will observe also that there is one table for cameras with shutters marked 1/10—1/25 and 1/50 of a second, and a table for cameras marked 1/20, 1/30, and 1/40 of a second.

Unlike cine cameras, still cameras make it possible to use longer exposures thereby compensating for weak lighting conditions. For example you can shoot indoor scenes where daylight is coming through a window. If light is shining directly on the subject near a window, a short exposure is satisfactory. However, if your subject is in

a darker section of the room you can make your exposure long enough to compensate for the absence of light. Your exposure meter will reveal this data. Reflectors should be used to illuminate the shadows, and to reduce contrast between the highlights and the shadows. Of course, if artificial light without daylight is used, Type A film without a filter is most satisfactory, and for daylight, Type A with filter is recommended.

The use of filters parallels that of cine Kodachrome. When making pictures of distant landscapes, high altitude shots, water and snow scenes, and pictures taken on foggy or cloudy days, the Kodachrome haze filters will improve the rendition of color. No change of exposure is necessary. Regular Kodachrome can be used in artificial light if a "Kodachrome Filter for Photoflood" is used. This filter requires an opening of one and a half additional stops. No filter is required for Type A when used with artificial lights; but when used with daylight Type A requires a filter made for that purpose, in which case the haze filter is not needed.

Kodachrome not only requires more light than black and white film, but, as described in the chapter on lighting, it should have a more flat and evenly diffused light. To accomplish this, you must plan your light and reflectors with our fundamental principles of lighting in mind.

Photoflood Lamps

The accompanying Eastman table, fig. 8, for Photoflood lamps shows the relationship of lamps and the distance the lamps are from the subject to the shutter speed and

INDOOR EXPOSURE TABLE

For Kodachrome Film Type A (K135A) using Photoflood Lamps in Kodak Handy Reflectors

Shutter Speed in Seconds	Number of Mazda No. 1 Photoflood Lamps in Kodak Handy Reflectors (either size) and Distance from Lamps to Subject		
	Stop *f*.2	Diaphragm Stop *f*.3.5	Diaphragm Stop *f*.4.5
1/20 or 1/25	2 at 4 ft. or 3 at 5 ft. or 4 at 6 ft.	4 at 3 ft.	
1/5 or 1/4	1 at 7 ft. or 2 at 10 ft. or 3 at 12 ft. or 4 at 14 ft.	1 at 3½ ft. or 2 at 5½ ft. or 3 at 7 ft. or 4 at 8 ft.	2 at 4 ft. or 3 at 5 ft. or 4 at 6 ft.
1	1 at 16 ft. or 2 at 22 ft. or 3 at 28 ft. or 4 at 30 ft.	1 at 9 ft. or 2 at 12 ft. or 3 at 16 ft. or 4 at 18 ft.	1 at 7 ft. or 2 at 10 ft. or 3 at 12 ft. or 4 at 14 ft.

With No. 2 Photoflood Lamps in small Kodak Handy Reflectors, use two lamps where three are shown in the table. With the larger Kodak Handy Reflectors (Model B), use half as many No. 2 Lamps as in table.

For exposures of 1/10 second, double the number of lamps given for 1/5 second and use them at the distances shown for 1/5 second.

For exposures of 1/2 second, double the number of lamps given for 1 second and use them at the distances shown for 1 second.

A tripod or some other rigid support for the camera is required for all exposures longer than 1/20 or 1/25 second.

The light from all Kodak Handy Reflectors must be superimposed on the subject, thus restricting the area that can be illuminated sucessfully by a few Photoflood Lamps.

NOTE: Do not use more than five No. 1 Photoflood Lamps on a single fused circuit; if six lamps or more are required, be sure to use different circuits. Do not use more than three No. 2 Photoflood Lamps on a single fused circuit.

Figure 8

EXPOSURE TABLE FOR PHOTOFLASH LAMPS

Using Kodachrome Film (Regular) (K135)
and Kodachrome Filter *for Photoflood*
Adjust the shutter for a time exposure

No. 10 Lamp with Kodak Handy Reflector	No. 10 Lamp without reflector	Distance Lamp to Subject	No. 20 Lamp with Kodak Handy Reflector	No. 20 Lamp without reflector
Stop Opening	Stop Opening	Feet	Stop Opening	Stop Opening
f.2		12	*f*.2.8	*f*.2
f.2.8	*f*.2	9	*f*.3.5	*f*.2.8
f.3.5	*f*.2.8	6	*f*.4.5	*f*.3.5

Figure 9

diaphragm openings. This table describes the speeds of 1/5 or 1/4 of a second and one second. For exposures of 1/10 second, double the number of lamps used for 1/5 of a second and place them at the same distance. For exposures of 1/2 second double the number of lamps used for one second and place them at the same distance. Two No. 2 Photoflood lamps in reflectors give as much light as three No. 1 lamps. As with motion pictures, the light from all reflectors must be superimposed on the same subject in order to be counted in the total number of lamps. For example, if different lamps are used to illuminate different parts of a room, they cannot be totaled to represent the light on any one subject.

The exposure table presents only the basic requirements of minimum lighting for a picture. However, you will get better results if you build up your picture with auxiliary lighting. Illuminate the shadows, build up highlights, and you might also indulge in a little back-lighting. Auxiliary lights are not included among the number of lamps specified in exposure table. For a more detailed description of indoor picture making, refer back to the chapter on lighting (fig. 9).

Photoflash

Another method of lighting indoor subjects is by using Photoflashes. The "Exposure Table for Photoflash Lamps", fig. 9, describes their use with reflectors, showing the relationship of the distance of the subject from the lamps to the lens-stop opening. The shutter is, of course, adjusted for a time exposure, during the flash, or

the shutter release is connected with a Photoflash synchronizer. If it is convenient to connect two or more Photoflash bulbs on the same circuit or to set them off simultaneously from different angles, you can develop the same lighting effects as you do with Photofloods. Otherwise, if a single flash is used it should be placed near the camera axis, an imaginary line between the camera lens and the subject.

Photoflash lamps will give best results where a quick exposure is necessary, or in cases where it is inconvenient or impractical to set up Photofloods. Pictures of children, animals, or any other subjects that are likely to move while the exposure is being made will do better with Photoflashes. Also, there are innumerable occasions where it would be difficult or even impossible to get desirable results with Photofloods: such as candid shots in a crowd, party pictures, out-of-door pictures, and camp fire scenes where electric current is not available. The Photoflashes do not require any other source of current than a simple flashlight battery. They are easily transported from place to place and are conveniently ready to capture the picture.

MODERN WRESTLING

by

H. Crowell Pepper

THIS is a volume different from any other photographic collection published. Mr. Pepper, one of the foremost authorities on miniature camera technique, has achieved what leading photographers have considered impossible: a coherent series of wrestling action pictures. Due to lens limitations, such occasional examples as have previously appeared have been hazy and indistinct, incapable of much enlargement and altogether lacking in any plan of presentation.

Mr. Pepper's collection, pronounced unparalleled by sports and art critics alike, has aroused such widespread interest in the course of exhibition that he has permitted its reproduction in book form. The following points are worthy of note:

Each picture is an unposed, ringside action shot. Despite that most of them were taken at *f*1.5, enlargements have been made to 11x14 and reproduction to 9x12, preserving amazing depth of focus and without grain clumping or loss of definition. For developing these negatives Mr. Pepper evolved a special fine grain technique, discussed in the text. The volume contains 96 pictures forming a continuous study of modern wrestling, a striking series of male action shots that will prove invaluable to artists.

A special process of reproduction, differing widely from half tone or gravure has been employed with the result that each picture is so faithful a duplication of the original print as to defy identification. Accompanying text on wrestling and an entire section on action photography under adverse conditions, fine grain formulae, etc. 9x12 inches, cloth and boards. $3.00.

PHOTOGRAPHIC CONTROL PROCESS

By Franklin I. Jordan, F.R.P.S.

THE need for a definitive book on control processes has long been felt by serious photographers not content to work within the limitations of the straight bromide print. Such instructions as have hitherto been available have for the most part been scattered and incomplete, utilizing obscure techniques and antiquated formulae.

"Photographic Control Processes" by the ever-brilliant and provocative Mr. Jordan is more than a volume of instructions in special control methods. It is a revaluation of art in photography by one of America's most honored photographers, written in the inimitable style and with the kindly humor that has endeared him to his coworkers from Brazil to Bombay.

OUTLINE OF CONTENTS

1. **Foreword**—The "why" of control processes, a modern estimate of Purism, a definition of control.
2. **Why Make Changes?**—A summary of art in photography, an intelligent aproach to control, working with method, etc.
3. **Bromide Enlarging**—A complete discussion of every phase of bromide enlarging, its possibilities, its limitations, most approved techniques, formulae, etc. Contains as much text in this section alone as the average complete book.
4. **Enlarged and Paper Negatives**—Over 5000 words on this subject alone. Many varied techniques described fully.
5. **Gum Printing**—Step by step instruction, discussion, techniques, formmulae, hints, etc. Over 7000 words.
6. **Carbon**—A completely new approach to this beautiful process that has been neglected because of the time element involved. New techniques cut time to a fraction.
7. **Carbro**—Full details of a process on which general information has been limited. Tissue transfer, color printing, etc.
8. **Fresson**—Careful elucidation of a process that permits the maximum of control.
9. **Oil**—Details of the forerunner to the Bromoil process.
10. **Bromoil**—The most complete discussion of this famous process ever projected. Contains 12000 words of text with the most meticulous and detailed instruction.
11. **Bromoil Transfer**—How to make duplicates of Bromoil prints. Contains 3000 words of text.

From the foregoing outline of contents it will be at once apparent that Mr. Jordan has covered his subject in characteristic, thoroughgoing fashion. His book is one that will be purchased by amateur and professional alike. Printed in large 7½x10 inch format, seventy thousand words, more than 300 pages profusely illustrated with pictorial examples of every type of control process. Many sets of progressive proofs showing the step by step advancement of a controlled picture. $3.50.

SHIPS AND WATER

A COLLECTION OF MARINES

Edited by

Alfred De Lardi, F.R.P.S., F.R.S.A.

THE SEA and its many moods, the ships that ply it, the men who make their living from it, the creatures above and below it—these are the subject matter of this thrilling new pictorial collection. Here is the ocean angry and at play, in storm and in calm; here are big ships and little ships, from the majestic ocean greyhound to the humble sampan, ships from all the seven seas, under sail and steam; men in fishing smacks, mending nets, furling sail, fighting the hurricane, under tropic skies and in the frozen north.

Eminent photographers from all parts of the world have contributed to make this volume truly representative. Its list of distinguished contributors includes Bernhard Benson, Margaret Bourke-White, Bernard Breedlove, Eleanor Parke Custis, Adolf Fassbender, Toni Frissell, Gertraud Haupt, Hisao Kimura, Edward Painter McMurtry, M. Arthur Robinson, Dr. Ernst Schwarz, Lewis P. Tabor, Freeman Pearson Taylor and many others. Out of the thousands of pictures submitted from all parts of the United States and Europe and from as far off as South Africa and Japan, Mr. De Lardi has created a skillful continuity of the saga of the sea that is at once dramatically effective and pictorially breath-taking.

Photographers, both amateur and professional, will welcome this volume for its wealth of fresh pictorial source material as much as for the sheer beauty of its powerful compositions. Magnificently reproduced by the most modern photogravure process in large 9x12 format. Design and typography by Heyworth Campbell. Contains 96 pages of pictures plus text, striking Plastic binding, cover in colors, boxed $3.00.